Region around Caborca

Sonora, Mexico

1943- 1944.

Index

Send prof. Ortmann Cambrian fossils. Also publications of the Museum in Pittsburgh.

Mr. Martines in the library at the Institute needs many publications particularly those of the New York bulletins, the outline book by Schuchert & me, the Washington Academy, Misc. collections of Smithsonian, personal reprints.

Section at El Antimonio

	1	gray ss. congl. at top	250 m.
	2	Quartzite (white alt. with schist)	200
Norie	3	ss gray, sh. & dark ls.	200
	4	Massive ls.	10
	5	Argillaceous sh. brown, with Pseudomonotis subcircularis	?
Carnic	6.	Red arg. sh. with fossils	30
	7.	Red arg. sh & red calc. ss.	50-70
	8	Red & brown ss.	100
Perm.	9	bed with Fusulina	

Jurassic of Catorce — see
Castillo, A. del y Aguilera, J.G. Fauna fosil de la Sierra de Catorce, San Luis Potosi. Bol. Comision geol. mexicana, 1, Mexico 1895.

Cretaceous in vicinity of Tehuacan. (Burckh. p. 158)
San Antonio de las Salinas just N of Texcala
San Juan Raya due west of Zapotitlan

Excursion de Tehuacan à Zapotitlan et San Juan Raya. Guide des excurs. Xe Congres géol. intern. Mexico 1906 No. 7.

OT

San Ant.
*
• Texcala

• Teloxtoc

San Juan
• Ranya

• Ixpatitlan

See Spinden mentioned by Angerman
Bol. Secretaria de Fomento, 2d epoch, Ano II,
1904-1905, 1905, p. 122

Trip to Mexico March 23 - 1943.

1 March 23 - Left Washington on 8:20 P.M. on B+O train called Diplomat.

March 24 - Pleasant and easy passage to St. Louis. Arrived on time and could have connected with Mexico train.

March 25 - Spent morning at St. Louis Zoo which made a very favorable impression. Fine collection including many unusual animals. Called on Courtney Wenck at Washington U. and saw some of his collection. Left St. Louis at 5:50 PM for Mexico.

March 26 - all night, all day on train. Arrived Laredo about 11:30. American customs took films away. Mexican customs very decent. Entered Mexico about 1 A.M. on next day.

March 27 - Woke up in Monterrey. Wonderful desert scenery all day. Reached San Luis Potosi at night.

March 28 - Arrived Mexico city 11:30 A.M. Went to Motel Guardi[illegible]. Strolled about in afternoon and evening.

March 29 - ~~Went~~ Went to U.S. Embassy in morning. Met Bill Fraley in afternoon

March 30 — Visited at Instituto Biologico. Reception very cordial. Favorable impression of Institute. Afternoon and evening spent with Albert Anyano who may go with me to Cabora.

March 31 — Morning spent 2 hours sending packages to Weber. In afternoon visited with Don White my companion to be at Cabora. He knew little of the area. Some tentative plans laid. Evening pleasantly spent with Dr. Mullaire & Sons some of his collection and had a pleasant chat.

April 1 — In afternoon went to the pyramids at Teotihuacan. They proved very interesting.

April 2 — Spent morning at the National Museum seeing the Archaeological collection. Afternoon with W.F.F.

April 3 — Morning on route to Jacao and pyramid at Xochicalco. These are on a high hill but have not been as well excavated as those at Teotihuacan. Afternoon arrived at Taxco about 3 P.M. and walked about the city until supper time.

April 4 — At Taxco. Went about one hour south of Taxco and not far north of Iguala to look for

Cretaceous fossils. These were abundant as cross-sections on a hard limestone. None of the specimens was silicified. Went down to Iguala, very picturesque village. Returned to Taxco for lunch. Afternoon visited a locality north of Taxco about 11 km. for fossils. Here again only cross-sections of snails were seen. Collected seeds for RWB.

April 5 – Spent day on route from Taxco to Mexico City. Collected insects, seeds and a rat en route. Looked over Cuernavaca.

April 6 – Spent most of day at letter writing. Saw Don Wilbur in evening. He is to leave for Sonora on Friday.

April 7 – Morning went to Museum of Natural History. Examined mostly Mexican Natural history objects not well displayed with very poor lighting. Practically no Paleozoic fossils at all and very little material of any kind from the United States.

Afternoon walked in southeast part of city.

April 8- Spent morning at Smithsonian with Matthias Portilla, the librarian. Afternoon was spent talking with Mr. Portilla outlined the needs of his library. Promised some help.

April 9- Wrote letters, had dinner with [redacted]. Mrs. Saul went to a movie.

April 10- Met Arellano, had dinner with him and his brother Carlos. Went to Jasco with Bill Forbes.

April 10- Went to Jasco with Bill Forbes.

April 11- Jasco to Chapanal through rugged interesting country to fluorite mines on deep canyon. Stayed overnight in company cabin.

April 12- Left Chapanal for Jasco where stayed overnight.

April 13- Jasco to Mexico City with side trip to Lake Zempoala for some collecting S.W. of Ixtaccihuatl. Small group of ~~ixtaccihuatl~~ surrounded by beautiful mountains. Collected a variety of small animals.

April 14- Met Arellano, visited Flores for final arrangements on trip. Flores wants all Paleozoic and Trias studied and collected. Visited Petroleos and met Cumings and Jones. The latter is one

of the two young men who found trilobites at Cabeza. The latter printed a sketch map of the area.

5

April 15 - Met Arellano for further details of trip.

April 16 - Travelled about city with Arellano to pick up maps and data to be used in Sonora.

April 17 - Got tickets and cashed check. At 6:45 started for Sonora.

April 18. - Arrived in Guadalajara 2 hours late. Sonora train waited for us and we got under way at 4 P.M. All afternoon through rough and mountainous country.

Sat R. E. King Palaeozoic Stratigraphy of Mexico. Pacific Section Congress 1942.

Check in Schuchert Antillean book for data on Sonora.

Las Taliafero, N. L. An occurrence of Up. Cret. sediments in northern Sonora, Mexico. Journ. Geol., vol. 41, 1933, pp. 12-37.

Kelly, W. A. Geology of Mts bordering valleys of Arizpe and Los Delicias. 1936, BGA Bull., vol. 47, p. 1009-1038

6. Adams & others 1939 Standard Permian section of North America, Amer Assoc. Petrol. Geol. Bull., vol 23, p. 1673-1681

April 19 - Woke up just N. of Marathon and had my first look at the Pacific. Train became Cañon and later.

April 20 - Reached Alpine about four hours late. Country not unlike that of the Hunton of Texas region. Arrived Santa Ana at about 3 P.M. Met Dr Monteverde and dickered with him for about an hour to get a car. Walked to hill about 1 km. South of town and looked for fossils. The fauna found suggested a Cathedral age.

Call on Lee Private Walker Forest Guard, doing research for the F.B.C. San Father at Catorce province of Hidalgo

April 21 - Left Santa Ana at about 11:00 A.M. (Mountain Time) for Cabeza via little old Dos. The trip over although very rugged indeed was interesting the physiognomy of desert scenery and the mountains, far more than indicated on any of our maps.

7.

April 22 - hired a car in Cabra to take us to Bigas for a look around. Arrive at Bigas about noon. Just west of Bigas are two high hills composed of altered chalky limestone that showed an occasional nodule of a cherty type. Went west of Bigas to a low hill on the Alcantara. Here were more dark gray limestone but with large cinoceras, occasional coral and three specimens of Rhipidomella aff. aegeatica of R. dutertri. The beds are clearly Devonian or Mississippian and close to the latter.

Late in afternoon went east to the pass between the hills called Sierra del Provedor. Made a hasty survey of the section north of the road and discovered black limestone and thin platy brown limestone with a thick calcareous quartzite at the west end of the section. The quartzite contains dark sandy shale interbedded.

From the standpoint of collecting the day was a decided disappointment because most of the rock massive. Of making good collections of fossils. The limestones are too altered to yield good fossils in all of the specimens seen.

6

April 23 - Went to Arroyo Hills and worked on measured section. The hills have a simple structure, at least of the north end. Black limestones forming a ledge on extreme of the other hills is overlain by a great hundred feet of light gray limestone and shale from which 40 or 50 Cambrian fossils at three levels, 2 near the middle and one at top. The Cambrian is overlain by thin bedded and massive black limestone in which I saw no fossils.

Table of $\angle S$ and corresponding values for stepping up a hill in measuring a section

0° - 5.45'	20° - 5.05'	40° -
10° - 5.3'	25° - 4.87'	45° -
15° - 5.07'	30° - 4.65'	50° -
		55° - 3.27

April 24 - Section of Cambrian beds measured from pole at base of Cambrian where lower black limestone are separated by a gap. Section began at south end of north segment of black h. Strike measured on lower part of ϵ - N23W dip 51° E. On the lowest part of the section the dip is 20° but the angle of dip increases to 40°. The compass was set for 30° at the base of the section.

70

A – 70'
A – 28'
B – 10'
C – 3'
D – 9'
E – 28'
F – 11'
G – 3'
H – 28'
I – 3
J – 19'
K – 42'
L – 46'
M – 135'
N – 33'
O – 38'
P – 57

495'

557'

557
124
691'

487
70
557'

G ✓ A- 6 steps of pure orange-yellow ba. on weathered surface, fine-grained greyish Yellow to grayish limish and with conchoidal fracture

✓ B- 2 steps +2' of reddish sandy shale. Shale hard, brittle, slaty, mottled of greenish gray color

✓ C- 1 st (min) -1½' hard ledge of grayish, blue gray to light gray.

✓ D- 2 steps green calc. fos, slaty shale fossiliferous and shiny

✓ E- 6 steps hard salmon weathering limestone like A.

✓ F- 2 steps +2'- greenish, red-weathering hard slaty, sandy shale.

✓ G- 3' hard, massive fine grained greenish to pinkish grey conchoidally fracturing ls.

✓ H- 6 steps greenish slaty, thin-bedded shale. Tot F-H showed a dip of 50°. The base of G dips 30° so el go back to 30°.

✓ I- 3' massive ledge of limestone, fine grained greenish to pinkish grey

F4a F4 11ft	P
8 ft	O
F3 7 ft	N
F2a 19 ft F2	M
10 ft F1	L
9 ft.	K
~~4 steps~~ 3½'	J (F1) I
5½' 6 ft	H
3 feet	G
2 ft	F
6 ft	E
2	D
1 - 1½	C
1 ft + 2'	B
6 ft.	A
Bl. ls.	A'

10. J.- 4 steps in green micaceous shale. The shale in this part of the section seems to be more highly metamorphosed than that at the top where the trilobites were found yesterday.

K - 9 steps - Dark gray & black massive ls. ~~with one limestone~~

L - 10 steps minus 1' - black, thin-bedded shale with thin beds of limestone. Fucoids only approximate as shales are distorted. Contains in the ls: Acrotreta, Acrothele? (F1)

M - 29 steps - Platy, thin-bedded limestone becoming somewhat more massive at the top. Some oolite and green shale near the upper part (F2a) with occasional trilobites

N - 7 steps - green micaceous and black shale containing thin layers of oolitic limestone with rare trilobites.

O - 8 steps - This marks the highest spot on the section and is 210 feet above the plain. dark gray ls, impure thin bedded but holding cuttyhunk, At top oolite and Lingulella abundant

P - 11 steps - green and black shale with thin layers of limestone. Trilobite and Wiumandella present.

11. Q - black limestone containing small brachiopods suggestive of Triarcuella
The dark Girvanella-like markings are common in O and were seen at other places, for example in the hills north of El Paredon which is a black limestone. This limestone mass may belong below the section made here in the black limestone under A.

Collecting at base of L is fossiliferous.

F1. The gneiss with pinnacles and ~~base~~ possibly from higher on the slope. High Lm bed M. Not true, they are from near in place.
Base of bed M is F2.

After returning to car took sights on Cambrian contact with beds N23W then paced perpendicularly to this strike along the plain until I could sight the Hy contact. The distance between the two strike sights was 430 paces or 860+215 = 1075 feet, which with a dip of 30° gives 537 feet for the thickness of the shaly Cambrian. By measured section = 495'. 557'

Plotted on the basis of a 40° average dip the section would be 691 feet thick and each bed should be multiplied by the factor 1.24

Albert to Rancho Grande
a dip of 60° would give 900' but
a dip of 30° would be 1800' the true thickness

12.

April 25 - On Saturday night April 24 Monteverde, with Rudloff Lech engaged to guide us, put in an appearance in our ancient Dodge. On Sunday morning he took us to Fossil Locality which is on the south face of the Cambrian hill just beyond the thick limestone ledge that forms a ridge along face of the hill. This locality will be called (F1). The fossils come from little patches of shale on the slope, patches not yet covered by talus. It is probable that all the lower shales contain trilobites. These trilobites are 148' above the top of the black Es (A').

F4 is the top Fossil bed about 15-20' below top of P. The top 8' of P is yellow weathering cobbly limestone, then bedded and breaks up into small pieces. A bed 4" in from top of P and this is called (F4a).

$$\begin{array}{r} 82 \\ 76 \\ 68 \\ \hline 226 \\ 3 \\ \hline 678 \end{array}$$

$$\begin{array}{r} 226 \\ 33 \\ \hline 678 \\ 678 \\ \hline 745.8 \\ 1004 \\ \hline 1749 \end{array}$$

.026

13. April 26 — Section on ridge above

B. At the very top of the Pinella and in the overlying Clear Fork Limestone I got a dip of 45-53° and a strike of N 22° W. The section was started in the ravine a few ft below the contact with the Geographic Formation and down to the base. For measurement of dip using 53° NE for the dip. The previous section should probably be recalculated on the basis of a 52° dip. The elevation at the beginning of the section is about 55' above the plain. Slope angle from base to top of first hill is 27°.

Up the face of the mountain are 82 steps plus 2 to the very top where the Limestone changes abruptly from black to light gray. The highest above the plain I reached by measuring at 205' The 82 steps measured are in dark gray to black, heavy-bedded dolomite. The upper part but thin-bedded limestone in the lower portion. The slope is composed mostly of dark limestone and dolomite? The former when fresh and nearly black when weathered, splitting into flat pieces. The surface and rough from weathering. I saw no fossils except a fragment of tubular stem (?) of Pseudoschwagerina (crinkled)

Stalker's Ave Quad
82 76, 34 = 226
145 ft + R - R

Tan 27 = 155/C

C tan 27 = 155

C = 155/.5095

.5095) 155 (306'
1528
31 00

C = 306'

306/.53

sin 53° a/306

a = 306 × .798

244
407 16
23936 0
24343.16

243'

27°
155'
C
A

262
243
218
932

1393
1655

713

14.

About 3/4 the way up the hill on the west side Ran Hoff ale the rock to the top of the hill is Cambrian. At the top of the hill the rock is a light gray-weathering, fine black grained to light gray-to black is a brown-colored dolomite when fractured. The upper half of the black rock has a dark shade of blue, slightly darker and a thin dark light rock is just above black rock.

34
32
66
102
243'

Ran west along the strike S E (down the strike) for a point 25' higher than the previous point to cross the section to the top of the next hill. Slope angle on this hill is 8°.

26
32
58
128
186

$\tan 8° = \frac{25}{c}$

$c = \frac{25}{.1405}$

.1405
533
.1405 / 75
70 25
42150
4215
74950

Q 76 steps in the dark, metallic gray rock. = 249'

Q 34 steps to east of hill. Twenty-three of the steps are in light gray dolomite but the remainder to the top of the hill contain rock in the dark gray rock. The top of the hill faces the point of Ephraim and the ~~[illegible]~~ the easternmost hill at Canon is N 53° W from this hill and the longest E & W distance is N 74° W. = 111'

$\tan 53° = \frac{133}{100}$

.1981
533
59430
3958
39430
92 72510

427'

From this hill to the strike begin the section outside the small hill at the west end of the hill and includes it well within the division Q. plane and begins as yet the dividing line

.6018
.545
30090
24072
5.480892.1986
.545
27981 6

.0400 1
.0256
.0144
.56
.0801

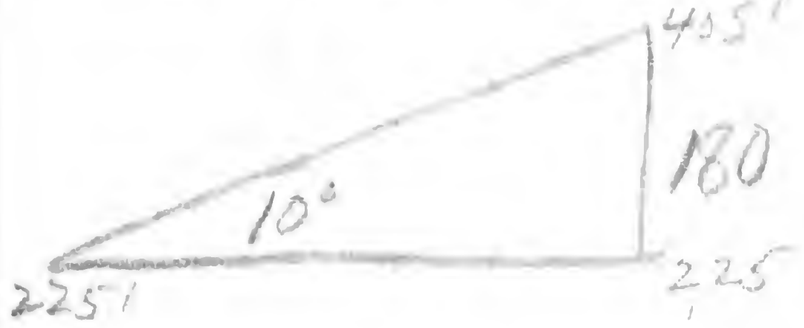
14
19
17
60
36
34
9
66
52
125
132

432 1
864
216
1080

7272
4.1205
4.360
9.7250
73.1630

.9272

mass and it all seems to be E.
The hill with elevation 300' is
N45°E from hill at 225' Long D64°E
15. Age transition high hill and light
back on hill 300' to pick up my
bearings. On this way at base two
two hills of nearly equal height and
take in entire section.



Section page 9

34 more steps mainly in light gray
dolomite but with some black flecks.
Taking bearings down the hill to the
plain 8 tip lies stepped to 68 degrees Azimuth N30°W.
R 14 steps black rock (30 paces)
S 19 steps rough fine grained, gray
weathering with light gray interior
Covers a horizontal distance of 36 paces.
T 17 paces massive black rock, much
pitted and with steely gray interior.
U 60 paces light gray weathering light
flint gray interior, fine-textured.
V 36 paces moderately bedded brownish
gray to dark gray weathering black
rock. At 36 a zone of bands
nodules but changes to a silicious
rock.
W 34 paces same thin bedded dark
flint gray rock
X 9 paces Hard, brittle mottled brown
& gray rock. Weathers salmon gray
at top. Calcite fragments?

(F5)

Z 52 paces dark gray massive dolomite
Z 2 paces yellow algla
A' 12 paces mottled brown and dark
16' gray limestone, 2 trilobite fragments

B' 52 paces, thick ledge of black lime-
stone containing some light gray to
cream dolomite. This is the end of
the mountain on the east face but
a small amount of section
appeared on the nose for the plane.

C' 125 paces measured on plain to be
added to section consists of some
dark limestone, metallic blue gray but
with light gray chert at top.

Total of ~~932~~ 1001'

Δ Specimens collected under
upper trilobite beds 58°–60° and
strike N25°W dip to east.

Smoke the total section above the
upper trilobite bed 1393' 1744'
Albert's map figure is about 2000'

17. Examination of beds in Limestone Fm. The Cambrian shale beds. On NE face between faulted piece and the small segment to the Northwest the Structure is N 29° W 39° E.

Structure in the little "faulted piece" is N 30° W 29° E. The strata in ledge have normally a flat block & partially cemented, possible Talus. Hisinely not be a fault but may represent unconformity. Beds The Dip & strike in Western Small hill are N 25° W 20° E

Between the western most hill & the "fault" block are gray to olive shales measuring 25 yards across the strike. The may fill an old channel. The shale ledges are nearly vertical whereas the adjacent limestone has a dip and strike of N 25° W 20° E

Same wrong about the shale being vertical as it dips in conformity with the black limestone in a small area. In and this limestone beds fossils are numerous and a large collection was made. The shale, 25 paces horizontal at 20° must be added to the base of the section on P. 10-12. This width

18 will be (F6) and in the lower E
fauna so far seen.
At the point where I took my
section I went over the hill in
the dark limestone below the shale
I cut the ledges at 300 and made
61 steps to the top of hill on N 25° E
to the next ledge 10 steps further
the upper of black limestone underlying
with the O and from which I
removed the Cambrian material
suspect that the 40 feet to
the ledge from the lower ledge,
at least should be added to the
Section for the shale and thin
bedded L at (E) which are
occupied by the upper of black
limestone removed separately. The
black is about 284 feet thick
when measured here.

3
46
61
107
279
284

Walked SE to second hill from
spur where Section was made. The
rocks all clearly belong to the black
limestone and the O. The shaly
Cambrian does not show SE of
the long hill in which it is so
prominent and must be buried
in the broad valley between
the black to below the E" and
the black and dolomitic limestone
above the E.

19. In the evening we tested samples of the rock from the upper Cimarron above the Tabletop sh. Most of this rock proved to be dolomite as suspected. We thus have a shale formation and a dolomite formation. For the sake of discussion we are using three formation names here: The "Jojoba formation" for the lower black limestone; Los Arroyos formation for the shale, and Tan formation for the upper dolomitic rocks.

The Jan formation is definitely Cambrian and is probably older than the age of the Jojoba is yet to be determined. A finely bedded limestone which shows some flow structure. It is massively laminated in places, black in color on the outside, occasionally light gray. It weathers very rough and pecan. The Kf contains thinly interbedded flat weathering shale. It also contains the black calcite "eyes" or "Cryptozoa" which are present also in the Cambrian Arroyos and the Tan formations.

U.A.F.D. '24

20. Spent the entire day collecting on the Cambrian Arojos Fm. Found no new horizons but made a good collection of hand sized specimens from near base of Del M. Fossils are not abundant in the shales anywhere. The shales like most of the rest of the rocks are altered, sometimes quite much so and all of them strongly indurated so that they break into flinty lumps rather than into thin flakes. To break the shale for specimens is well nigh useless as they are generally splitting and will not break with a smooth surface.

A split limestone at many levels but only found a few that had good specimens. I find M Fm oolite at the top and scattered through the rest but not fossiliferous although they sometimes show cross sections on the surface.

The fossil zone in the El Paso formation at the very contact with the Cambrian but the fossils, Beecheria were found in horizons 6 strings in the black limestone about 1½-2' above the contact.

Characters - color, texture, lithologic structures (flow, banding, etc.) weathering, topographic expression
Notes on topography, weathering etc. of E..

21.

April 28 - Examined Tonpeth Creek again and made the following section with Compass sct at 25°
Dip and strike N 30° W 25° NE.

30' G
5' F
5' E
5' D
5' C
35' B
15' A
Dojola lo

A - 3 steps thin bedded greenish fine-grained clayey shale with thin bands of fine-grained sand limestone. At base is a prominent layer of lr. some 2-3' thick with about 1 foot of shale between. This limestone and shale has a short distance above - if abound in fossils.

B - 7 steps of platy lr.

C - 1 step reefy limestone, gray color

D. - 1 step in red sandy shale

E - 1 step dk reefy lr.

F - 1 step thin - bedded platy limestone

G - 6 steps reefy limestone, coherent weathering brown, cemented by calcite lime. The most front of this bed is on line with the front of the Dojola lr.

Section arranged from April 24. Col April 29 = A of Section April 28 = G of Section Below

Cerro
Prieto

~~Cerro~~
~~Prieto~~

On east side of hill sec 2 a 6
ft. covered ledge of Ls. 4 ft. thick
dipping 22° to N 27° W.

Below ledge a few ft. of Calc.
Shale thin bedded Ls. & Shale
Ls. bedded Limestone, thick forming
a thick ridge along the east side
of the Metr. Oolite near top.
Members thin 6 to 8" beds Calc
and Shale, near middle & top.
No fossils in shale & Black shale
with an occasional boulder 5 lbs. or so.
Overlaid by with layers of light
brown and dark gray Ls. 6 ft.
predominating each 1-2" thick, the
brown up to 3/4"
Along the strike the shales of
bed N grade into platy Ls. & back to
shale again. Bed Oil plainly but
well exhibited and very platy in
places along the strike.
Just in front of the west slope
at the end of the E exposure
is a limestone Knot of black Oolitic
limestone that overlies part of
beds L and M. The Ol Zone

23 also overlies the Cambrian at the high peak at the S end of the Cambrian exposure. Here the black limestone strikes S45°W and dips 43° SE.

Beds K and O form resistant ledges and low walls that bound the less resistant parts of the E.

On Skeide Mtn 5 strike is N 20 W 65° E in ribbon banded brown & gray ls.

At 3 PM walked over southern end of hill 6. Entirely composed of dark gray limestone, often marbled with light brown, with many small calcite veins. When fractured is fine grained dark blue-gray. Much pitted by solution. The pits small & deep. At present does not appear possibility of separation from the Dejohn to the west.

April 29 This morning more fair trout on the can. Montevede started a line to get as we let him go. Paid him 10 cents for his week's work with us. This can't be much time.

Pack 2 - Panorama from mouth of west under summit of El Jebel, also view of distorted beds 1, 2, 3.

24. The limestones of the Jojoba form seem to be much more metamorphosed than those of the Arrojos and El Fren formations. The Jojoba seems to have flow structure and has many small veinlets of calcite. I have seen no trace of fossils in the Jojoba although the limestone suggests that of the Arrojos. Both formations contain the _Girvanella_-like bodies.

The thickness measured on the map by Albert with a 40° dip gives about 1500' for the thickness of the Arrojos. From my thickness I may be able to subtract 185' if I correlate bed B of the fault piece with the lower band limestone at the base where I took the section. This would make my thickness on a 30° dip 472' and on a 40° dip about 606'.

Albert makes, on map measure, 2010' for the thickness of the El Fren division, this about 300' higher than my thickness.

We agree that all the salmon ls at the fault + all Salmon ls at point where section was made are equivalent. We then add only the thickness of the lowermost shale.

Along contact - in trilobite saddle rocks often offset and one much distorted mass on front slope of saddle.

25

Pictures 4 + 5 are thin mass. Dips on top + bottom of upper ridge. Red Post open Southeast up the canyon.

On the saddle at the South end of the canyon dips on the El Dorado almost due East. On the South face I measured N 35 W 55° SE. On the SW face ribbon banded ls strikes N 25 E and dips southeast almost vertical.

On the west side of the hill the canyon, where it takes a turn the El Dorado is sheared and turned over. The turning here and under the El Dorado at the northwest edge is to the west.

May 5—

Traverse to S hills of Arroyo

Sta 1 - SW end of Gage E Next hill to tip of hill S 3° E 500 paces. Back sight on very SW tip of hill N 35° E.

1250

Sta 2 - tip end, NE of hill on opposite side valley. ③ S 40° E 65 paces S 5° E 666 paces. ④

1250 - 65 = 1185

Set 300 paces the rocks are black limestone, fine grained crystalline blue gray. The strike seems to be about E along the front of the mtn along the line of traverse.

At 666 paces opposite a big bay in the Mtn.

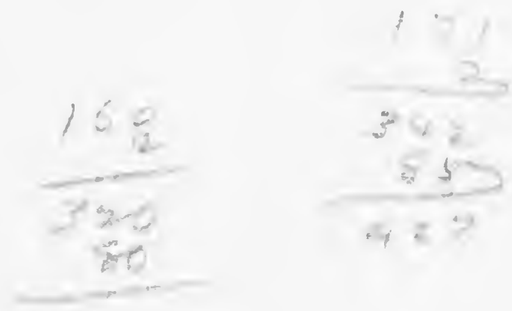
2

⑤ S 80 W 300 paces to inner wall of Bay

Bay stands NW possibly 100 paces.
Strike here is roughly N 60° W 30° NE
The rocks in this bay consist of
No dark basalt, shaded light gray
to, and light gray dolomite. Seems
to be definitely faulted.

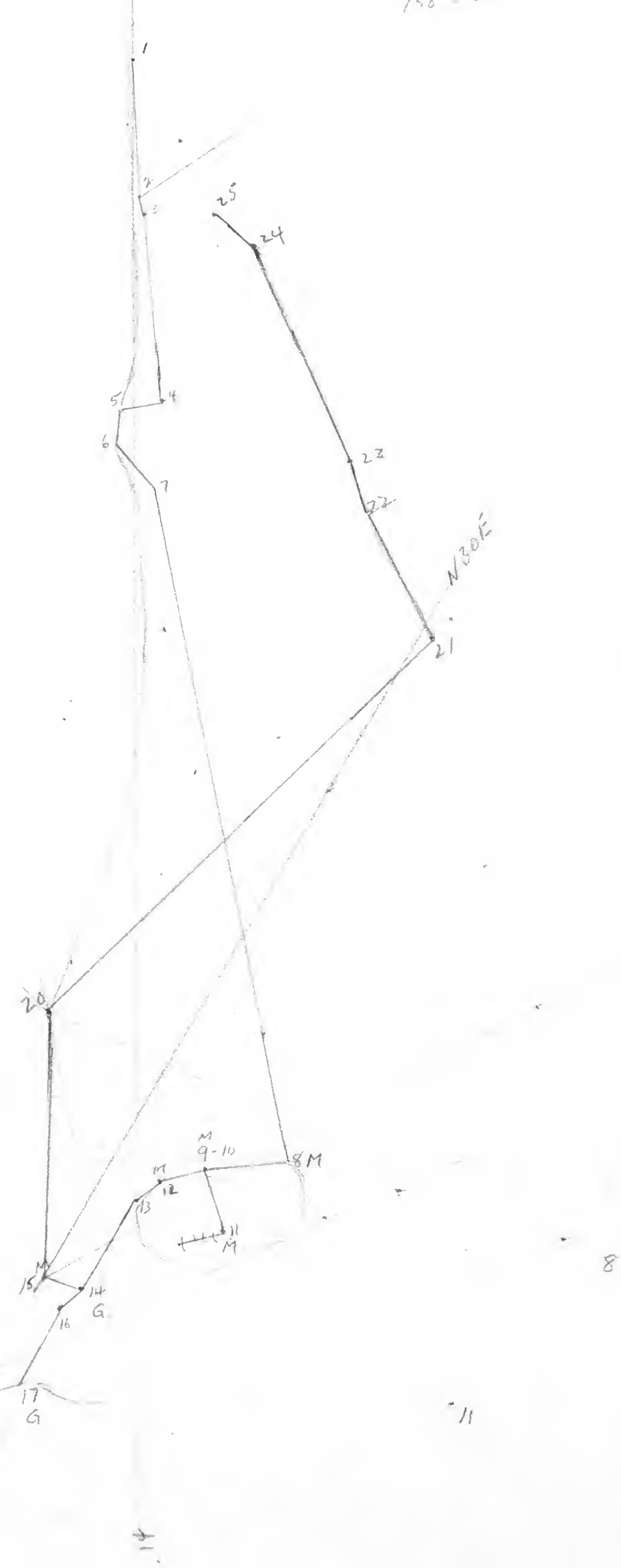
6 S 5° W 154 paces
7 S 40° E 220 paces, NE tip last hill
8 S 11° E 2477 paces
At 210 paces the hills break
away into a wide valley to the SW
At 1427 paces road opening N 70° E
At 2477 comes east front and
base of first mountain, here the rocks
are finely granular fault marble.
9 S 65° W 275 paces all same marble
11 S 85° W 78 paces mouth of small canyon
11 S 18° E 220 to divide in canyon
where there are moderately dark
grey cryptocline marbles, lighting
on the south point of the hill from
which a strike N 43° E. Light on
the south point of the next hill
south N 22° E. On the west side of
this small canyon rocks are N 65° E
27° W. On the other side of the
canyon is the same kind of rock
13 S 75° W from canyon mouth 150 paces, a
sharp ridge in the grey granular
marble. Here comes a valley to the
south
3 S 54° W 104 paces into valley.
14 S 30° W 369 paces, the last 169 paces
in dark granite gneiss in place

and sandstone or quartzite float.
N 70°W 125 paces a small hill of
marble strike N 40° E 190 W.
7 A 0 A sight on hill south and hill
South of starting point is N 30° E.
Sight on SW tip of knoll claim is
N 2° E. In 7 under marble mass
is igneous rock
Starting from point just before
small marble hill. (14)
(16) S 49° E 95 paces quartzite dipping
and striking S 75° W 20° NW. The
quartzite and very hard and show
contorted laminae with green
shaly matter in the bands.
(17) S 25° W 307 paces to the point of small hill, which lies between the two main masses. Granite all the way.
18 N 75° W 1500 paces granite all the way and to the end of the long chain.
N 65° E paces 542 back to small marble hill.
N 19 N 2° E 923 paces to point of long Jojoba chain
Road at 623 paces on this right
at the point of the Jojoba claim
the limestone is greatly mingled
Lights from point of Jojoba claim to:
point hill 1 — S 65° E
Saddle hill 1 & 2 — S 45° E
Quartzite — S 11° E
Marble hill — S 2° W
Point Granite — S 25° W.
N 45° E 1880 paces to point of
hill south of knoll.



1" = 2500'
1/2" = 1250
1/10" = 250'
1/50" = 50'

Drawn
by May 1



8

11

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(22) Here strike + dip are N14°W 48°SW.
N18°W 500 paces point with dip +
strike N23W 58°SW.

26 (23) N 17°W 160 paces

(24) N 24°W 822

345 mouth end of hill

(25) N 46°W 171 paces. Elbe Traverse

No. 7 on pack 2 is ribbon-banded limestone on southwest side of "Mount."

May 2 - Stayed in all day.

May 3 - On May 1 albert and I examined the Arroyo El Tecuanteco together to see if not there were evidences of faulting. In the Tehuite saddle evidence for faulting is not conclusive. In it there are slight displacements along the contact which may be accounted for by the soft shale at the top of the Arroyo. Some brecciation occurs along the contact but it is broad and may be accounted for by talus material. A block of Lower El Pico was seen that was obviously deformed but it could not be determined whether the deformation was due to structural considerations or weathering. Against faulting is the apparent conformity of the beds and of fossils.

On the ravine the contact is lost until near the head of the ravine where it appears on the east side. At the SE end of the E outcrop evidence of faulting is present.

29.

Here under the El Zen entering at the NW point of the hill was the bed of the ravine. The Arroyo under the El Zen and the flat belt of Lower Mancos pushed over into it some nicely fold. Furthermore along the SE flank of the hill the Arroyo under the El Zen is somewhat undulated. If the relations were just as unconformity it is doubtful if the disturbance would be present under the El Zen. Also just NW of the point of El Zen overlying the Arroyo is a small outlier of El Zen much distorted but showing the step dips that are a feature of the El Zen at this place. As the Arroyo is followed SE along its strike the beds steepen until they are nearly vertical or have high dips to the SW, opposite to those at the north end of the outcrop.

May 3-

The ribbon banded limestone member occurs on the SW face of the big El Zen mesa and overlying the Arroyo forms the inner or NE side of the mesa of El Zen that protrudes over the Arroyo. The banded beds strikes N25°-30° W and dips about 60°, this apparently a fairly thick layer.

On south west slope over Arroyo the base of the El Zen appears to be truncated.


Integral Lines
E1
E2
E3
ET
ET
E1
ET
EA
EA
ET
EJ
ET
2
6947
250
34735
1389
173.2750
.6691
5.45
38455
26769
3855
3146595
E 1.7
1.300
226.4100
120
45
40
24

Thickness 4 ribbon banded marl on top of zone in; slope ∠ = 33°; height from top of ledge to top of zone and base of Unit 2 L

30.

At 11 handlevel steps comes the Jesse ofshamed to attend to measure. This strikes N 25° W 54° E. Steps 10' - 1" thick 16 handlevel steps to base of nubbin capped ledge and 17 ft. on top to measure.

On S. side creek at Left Canyon from the coal [illegible] from "Thirst Pine Canyon a Gulch out crop of the contact of Entrada & Carmel for 2 of another prominent fault zone from 4 to 5 by Left side of creek to the base of the hill.

348
35
190
189
1134
1323
1

Key 4 - Hill N. Coal NW of Bryan Pass under BFI - Small hill NW of Bryan, about 180 feet of Light Gray, subcrystalline to crystalline limestone with few fossils in lower part but fossiliferous Carmel near top. Strike ~~[illegible]~~ 35°, 44° to NE. Three general divisions can be recognized: A. A lower division of 132' heavy-bedded, thick layers containing abundant beds of chert and few fossils, B. a second division of 14' containing much chert and a fair number of fossils, small corals, a Lingula, C. An upper division of 36' containing abundant fossils

10+' at 48° — 36' C

3 ft. 28° — Chert, 14' B

35 steps at 44° — 132' A

182'

Dist 70° — 220°
75° — 70°
53° — 235°

mostly the same as those below but in addition fairly large cup corals. Spirifer is common just over the thick chert bed and a few other fossils too. A species of Lithostrotion is present as is a very large Athyris. This formation is quite definitely Mississippian.

North of the Coal hill are three more hills, a low middle-sized one at the SE, a central longer one and a small NW one. The central longer one is separated from the one to the SE and at its SE end has a low secondary hill where all found fossils that at first are Devonian. These occurred in black limestones on the southern face near the eastern end. These limestones are much fractured and stand nearly vertical with ~~dips~~ S40°E about 170°.

The fossils include a small Spirifer with smooth fold & sulcus and a Schuchertella. This suggests Devonian.

May 5 - Morning spent at hills north of Coral hill N30°E 1455 paces. Camped on the NE side of the small hill and at the N end found dark and light Grey limestones with fossils. The fossils consist of the same species as in the Coral hill, both massive and digitate, a few Favosites and corals and a small like Platyaclisina. Strike on this side of the hill N35°W 60°SW.

Proceeding S the strike is 231 paces across this hill which gives a thickness of 500 feet but some of this thickness on both sides of the hill is occupied by corals.

On sighting NW on the large hill to the North there seems to be an offset of the fossil beds. The fossil beds are the same in both hills. The offset measured at 90 paces or 225 ft to the NE. This gap of 90 paces is occupied by dolomite beds in the large hill.

Proceeding from the fossil beds across the strike. Strike and dip here N35°W 73°SW. At 42 paces the Devonian gives way to brown-bedded light grey limestone with a pinkish mottling. At 110 paces the Devonian limestone overlies dolomite. A few Favosites occur in the lower part of the Devonian. This gives 262 feet for

Diagram of Bigan Hills

284
262
546
146

the Devonian limestone. Below the limestones are gray, light gray weathering and dark to black dolomite with thin sandy layers near the top which extend from 110 paces to 229 paces which gives a thickness of 284 feet for the lower beds. Of

As the fossil bed forms the north east edge of the small hill the section of the large hill can be added to that of the smaller subtracting the 50' for the fossil bed which gives a total of about 1000' of rock.

The small hill is 165 paces south of the larger one.

The east peak at Bigani is 525°E from the north end of the large hill

On afternoon at 2 o'clock went to coral hill and collected fossils all afternoon. Noticed a syncline trend on the same bed with the large anticline. Directions from top of coral hill:

to Sand Devonian hill (small) — N 13°E
to high peak (east hill of Bigani — S 63°E
to top of "conical" hill — S 44°W
to top west hill at Bigani — S 34°E.

As one goes NW in the large Devonian hill all the limestone changes to dolomite and only the SE end of the hill is in limestone. There seems to be no faulting but a dolomitization to the NW along the strike.

34.

May 6 — Conical Hill — 3000'
Sight from top of Conical hill to
Coral Knoll N43E. To east Benjamin
Hill is due East. To top big Dromedary hill
is N18°E. To N end Arroyo Hollow N25°E
and about 5-6 miles. Strike 7 dips on
high point N58°E 25°S. Find one
part of vein of bigger area of
Lilo & Stanstead Sandstone 28 steps
with compass set at 25° Run wall
rock for bedrock. Run 14 more of
the dark rock to be mostly cemented
blocks. Run 4 more & get a thickness of
about 52' for at least the part of
the vein. The layers with R. Shirka
are at the very base in dark gray
right at the contact with the Run
rock. Most of the dark gray is a
part of, the top of bedded and massive
ss layers of 2' in Thickness with
streaks of Pure sand. Strike This
Lilo ss 90°, the same as the
upper beds contain light gray chert
like layers, and similar to those in the
Lower part of the dark rock.
The Lower part of the hills ~~is~~ also
contain a small thickness of Lilo and
it is often difficult to say where the
rocks are Lilo and where Dromedary. The
Stratification has yielding Rhaetic
Shirka are in place and seem
near the bottom of the section.
The whole small western hill
Shirka is on the lower part of
the ridge between the Dromedary

35

feet forming the larger middle hill. The whole mass forms an E-W shallow crescent. hollow to the north

West end hill Strike N 70° E, dip S 15° W. This portion of the hill has strike and dips different from the larger part of the hill but inasmuch as the Rhipidomella bed occurs at the base of both sections, a strike section made in either part of the hills will suffice. The Rhipidomellas are in darker gray rock than the higher beds.

At coral hill The lower 30 feet of the section terminates at a conglomerate band about 1'-1½' thick. Fossils are rare in this part of the section and the chert is somewhat less abundant than above. Furthermore the rock weathers to a lighter gray and is distinctly

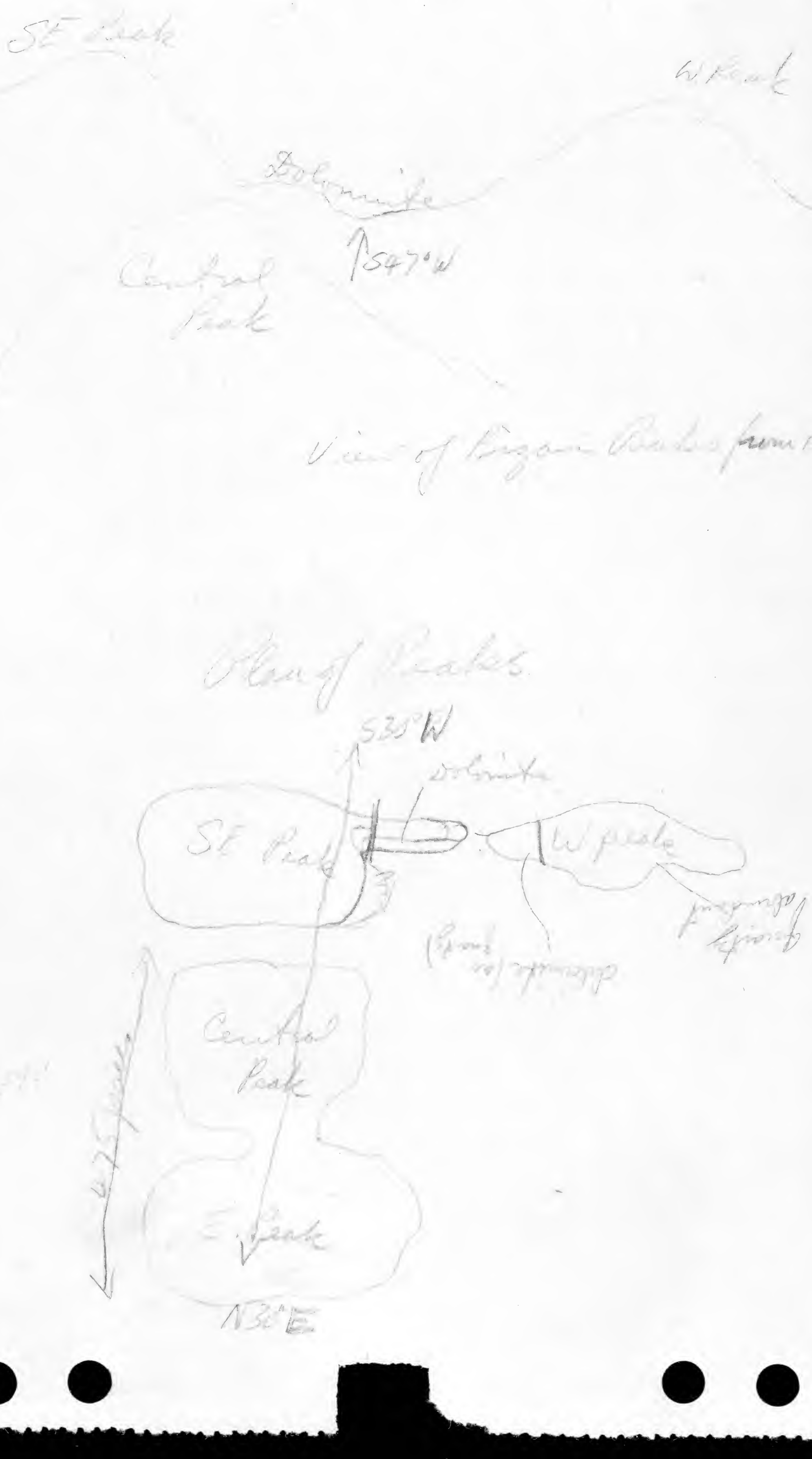
36

May 7 — Hills on west side Bajada. South side hills consist of light ash gray weathering dolomite on thick beds, often containing considerable chert. Strike S 76° E both dips 5° N. Here strike and dip is entirely local and appear to have no significance in determining the structure of the hill. One foot west of the contact in the southside of the southeast corner hill seems to be a limited lens that has been dolomitized. The rocks are so highly dolomitized that search for fossils seems hopeless. Here there is a small area of dark gray dolomite without that spotted shell mould. Here and there are patches on the surface that is evidently dolomitized oolitic limestone and could be Devonian or Mississippian.

Sights from top of high (East) peak at Bajada:

On S tip big Dev. Hill — N 30° W
" S " small " " — N 35° W
On coral hill — N 66 W
High spot on Carmel Hill — due W.

Came up NW face of high (east) peak at Bajada and the section consists of brown weathering chert, dolomite, dolomite and beds of quartzite. Towards the top the amount of chert is somewhat greater than that of dolomite.


St Louis
Wash
Bolmick
Central Park
View of Bryant Park from the
Map of Parks
S30°W
Bolmick
SE Park
W parks
Central Park
N30°E

37

Dark dolomite with ripple marks on it was found on this face. Strike on summit is N 31° W 25° SW.
Dike and dip on north side readable between E + central forks - N 34° W 30° SW

Horizontal distance between east + central forks is 475 paces = 594' ±

The east point of the west peak is made up of dolomite fairly coarse without any quartz and at first going west up the slope the dolomite gives way abruptly to quartzite. The dolomite is only found at this place. On the E peak the main part seems made up of dolomite but it contains quartzite in it on the south face. It appears that a small fault accounts for the relationships on the west peak. Strikes on the south side of the west peak are east and west and the dip is 60° to the south.

Rock has been very much like most of that since along here, so much dust has been kicked up that visibility is very low, 2-3 km.

Strike + dip on NE side of SE Peak N 60° E 59° SE. On the SE side the beds are contorted and some are nearly flat. The strikes have much the same E-W trend. On the north front ridges of

38

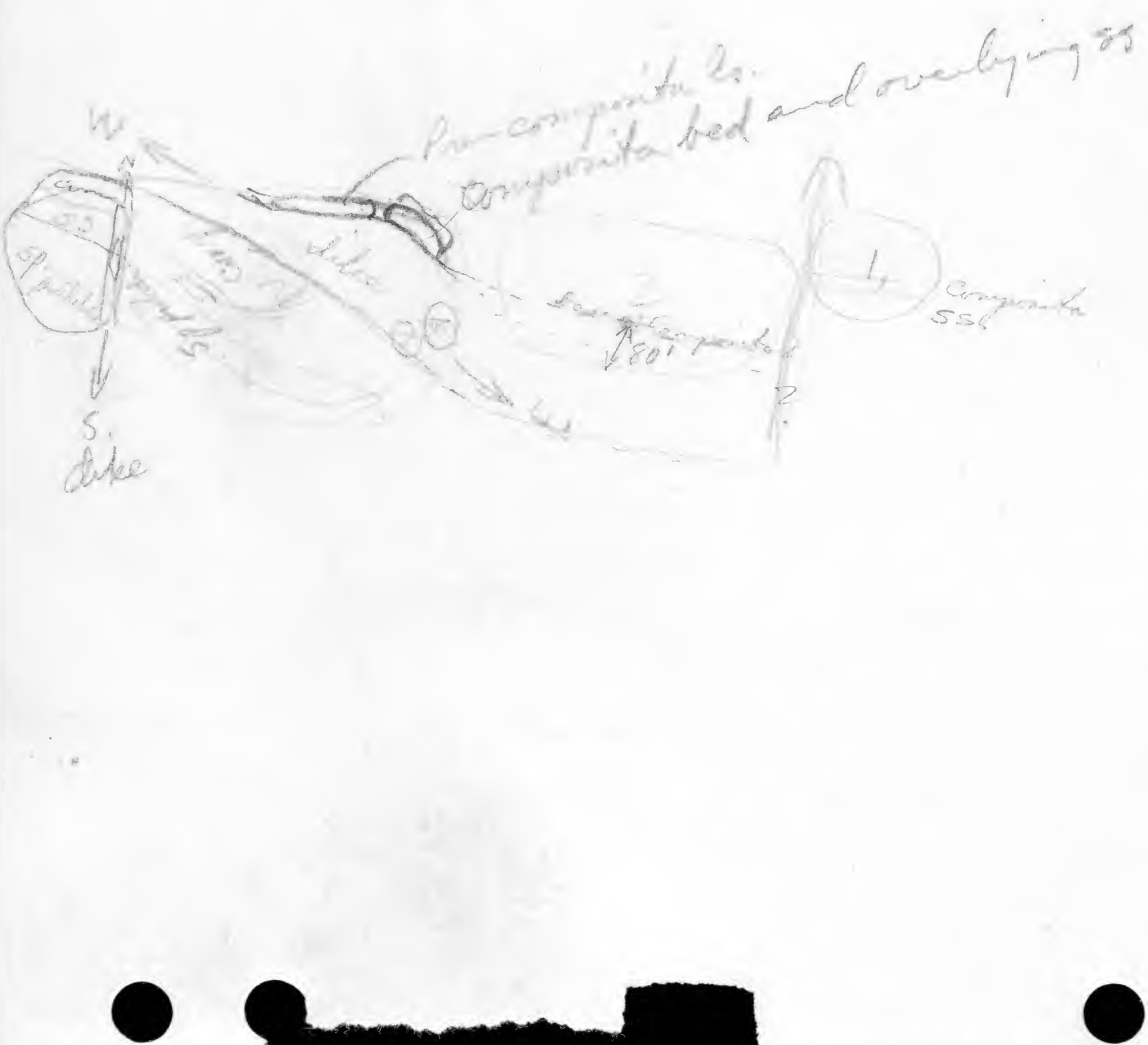
dolomite ocean that contain fragments of crinoids.

According to Wallace's Fig 5 the beds in this area dip to the SE at about a dip of about 20°. This would afford a distance of measuring the sequence here. There is a notable of days between the two hills, the north one dipping SW and the southern one dipping SE.

May 8 — The Eminence Hill strata on the east valley road from Eminence town to the south Eminence Rio hill consists of 3 parts or layers. The lowest part is a massive limestone striking E-W, 587°E with a dip of 48°S.

On the NE end the strata on the same but the dip is 62° to the south Here the rock is finely laminated near the base with laminated chert. Horizontal distance through beds is 128 paces. 582°E 42°S.

About 40 paces N of south end of hill on E is a terraced south large composite and subparallel thick beds Does rock massive chert to about 4 paces very similar to the lower part of the hill Low dip laminated chert to the end of the cliff.


W
S.
Silica
Pre-composite layer
Composite bed and overlying ss
Composite
ss

39

The middle hill is composed almost wholly of the siliceous limestone that characterized the east knob. None of the dark with abundant fossils appear on this middle hill but the same fossil beds + additional layers do appear on the third or westernmost hill. Here on the NE face the siliceous limestones of hill 3 appear but on the SE side the fossil bed and sandy limestone of the top of the east knob appear.

One west face middle hill strike N 77° E 26° SE. Through the west face made 33 steps with the compass set at 26° or about 160° of arc.

PF1 - Top of east knob on east end east hill of Mesa Alb

PF2 - SE side west or high knob of east hill of Mesa Alb.

May 10 - Spent all day collecting on southernmost hills of the Mesa Hills. Two fossil zones in the hills are very conspicuous: the lower one is of about feet and is crowded with a large Composita, Productus and some other species. This is separated from the upper fossil zone by a sandy limestone

The upper zone which forms the cliffs on the face of the hill contains Pancheropinifer pulchra, Waagenoceras and Aulosphinctes, Composita and also present.

The Composita bed is one each on the easternmost knob but on the east side of the west knob a dike cuts diagonally ( ) across the hill and contains small slivers of limestone. The dike cuts east-west across the hill it is 4'-5' wide

Strike contact of Composita & 55 N 65° E 40° SE The Composita bed is about 18' thick.

For the sandy limestone 8 measured 8 steps with compass at 40° which is roughly 35'. The limestone is blue gray when fresh but weathers light gray and the coarse grains stand out on the surface. The bed contains a few fossils.

Above the sandy limestone is gray blue granular limestone with scattered fossils. 10 steps with compass set at 40° or about 45' of rock. This rock contains some dark chert but is generally more flaggy just below. Spiriferina pulchra and Waagenoceras occur in it.

The west knob is composed of an eastern lower side and a western higher side, separated

Spiriferina pulchra beds 45'±

Sandy ls. 35'±

Composita 18'

A

B

41.

Through the saddle between the east and west knobs is a greenish gray dike that surrounds a small (maybe 4 inches) area of the saddle. The dike strikes N 0 5.

Picture 12 on page 2 is of Permian Concha Limestone T 5.

The red dike on hill material and across the S front of the middle knob for about 80+ feet. The front of the middle knob cuts about ½ the base of the Permian Concha limestone along a large Limonite bed may be a sill but as it seems to cut the bedding in the west knob it is probably a dike.

PF3 - Concha bed on North west knob of easternmost hill

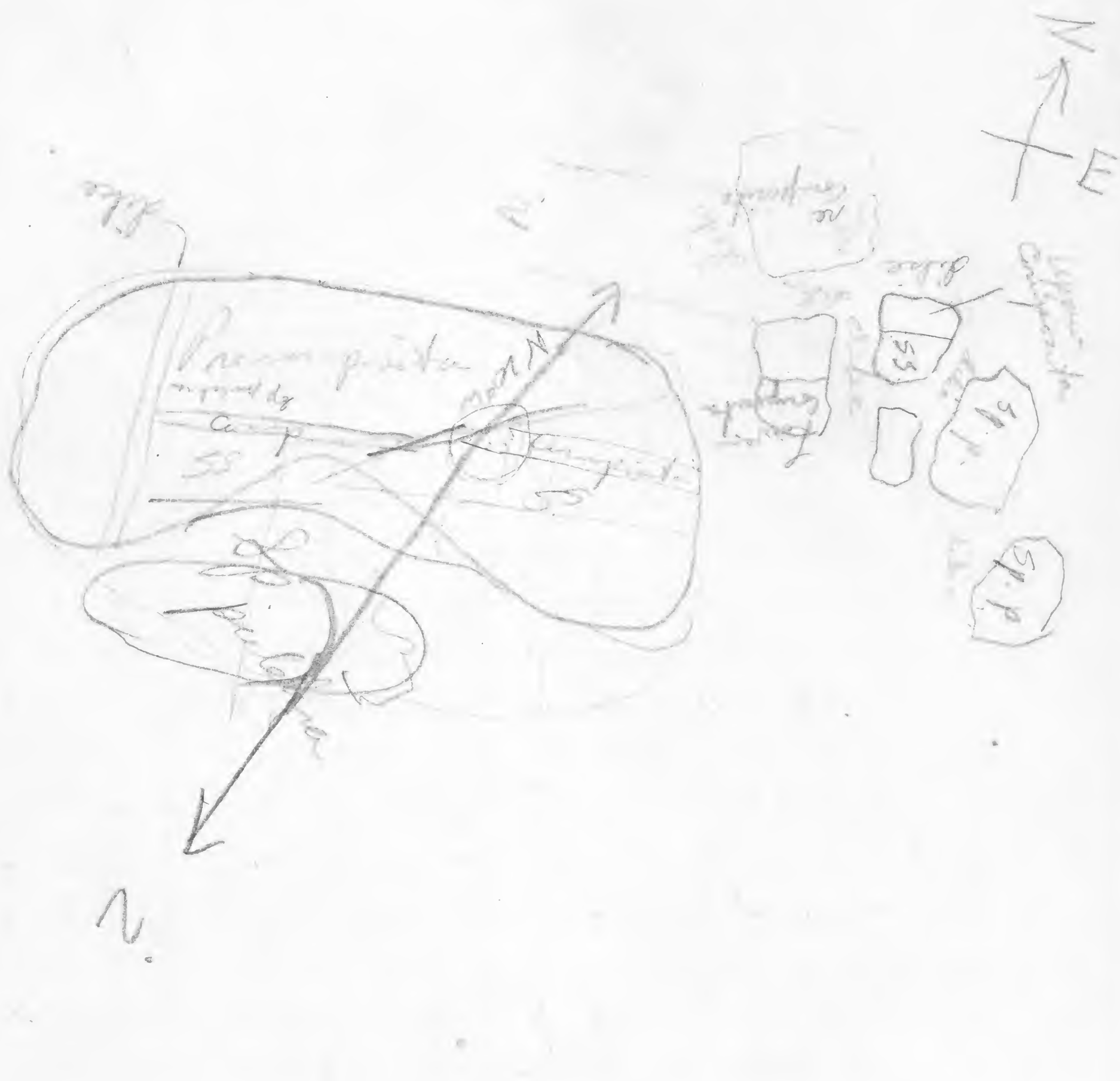
PF4 South westernmost knob, Spirifera pulcha bed.

112 May 11 - All morning collected Naut
ofith above Fennimore Hill
Lime Sp. pulchra in Conjunction bed
but it is extremely rare.
Especially recrystallized about 3 ups
in the ss.

Hill due west of Fennimore
hill. Large with tube tubes. Highest for
most beds is composed of Blue b.
of the Sp. pulchra zone but fossils
are mostly absent. Bike cuts across
S front and another between the
two beds.

May 12 - Exploration of heights of
Wolfes hill. — On the East side of this
hill and between it and the one
studied yesterday are several blocks
of Fennimore limestone, probably fault
blocks or beds. One large one
with strike N 25° E 70° N lies at the
northeast base of the mountain. This
block consists of blue to cream
large knots of chert. Below this b.
beds on the outside or above the
Sp. pulchra beds. Beyond this block
up the slope is limestone with
Sp. pulchra and crinoids.

The next large mass is on the
center of the east end of the hill.
Blue limestone with adma and



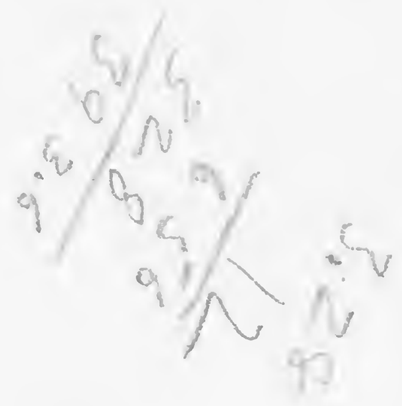
43

but containing corals, Spirifers, Productids, and occasional Conocoryta. This brings up to the levels of the mountain at the end. North + NE of this block on the divide are the dark shaly limestone cliffs of the Conocoryta. The big block on the divide is very sandy at many places. The upper sandy beds. Just N and west of the big block the limestone sandstone and has isolated a small block on the pass. On the N side of this block which has a sandy weathered Conocoryta is abundant. The dip goes 568° W and must cut off the lower half of the Conocoryta zone. At last the dike appears cuts through near the middle of Conocoryta if we can judge by its thickness. It has contacts on all around the block. North of this hill are several hills that probably underlie this one and may have a Pennsylvanian or Lower Permian sequence.

The Conocoryta zone is well exposed on the west face of the mountain mass. It strikes S 82° W 70°.

A small dike cuts NS across the hill just a short distance east of the crest. Its line is S 82° W 62° S.

The crest of the big hill is N 80° E from the crest of the west part of the easternmost hill. This crest is also in line with the



Up sandstone block on the South face of the second hill. The very crest of the big hill is formed of the basal sandy limestone beds. Just behind the crest, to the north, altered representative of the Composita bed is present. The Composita was readily traced for a mile or a few hundred feet west of the one mentioned below the crest. The bed also goes N-S but most of it the Composita zone was altered and very clastic and difficult to recognize at the very crest. The hill is 410' high.

The west end of the hill is wholly composed of the thin-bedded Permo-Pennsylvanian limestone.

About 50 yards west of the crest of the hill the Composita zone again appears in typical development but 150 feet below the crest of the hill on the South face. This includes a small oblique fault. This occurs 10 feet N of the north end of the small outcrop. About 75' of post-Paleozoic beds crop out and strike across the end of the ridge dip 70°.

31
3
66
17
63
9
94.1

Ideal Section of Permian

Port-Sp.
Pulchra with big Productids
75'+

8p. pulchra
60+

Rhodylinetes
35'-76'

Composita
10'-20'

200'

2

45 Small hill just west of Large hill just examined consists of Pre-Cambrian beds much baked and altered.

Chain of hills extending S50°E from a hill N75°E from top of largest hill on Mono group. I came about due N from the hill mentioned above and came over much red-brown baked beds. I got the idea that the Permian may once have been covered by red beds and are now becoming exhumed. Up the NE face of the hill I came over a long sequence of sandy clays and shales having beds, flat & thick that are pre-Cambrian, but on the crest of the hill these beds bend into what appears to be a thin veneer of pulchra beds. The contact looks like a fault contact. The pre-Cambrian beds strike N35°W 65°SW. Going east along the crest of ridge the bedding of the pre-Cambrian swings right into the general trend of the fault zone. The latter called the latter Cambrian because Cambrian beds occur in it but could not find the other rocks there.

Valcanic agglomerate. The next hunt from the previous one and the rock is blue limestone with patches of light & dark brown chert. This rock is the post-Cambrian

H

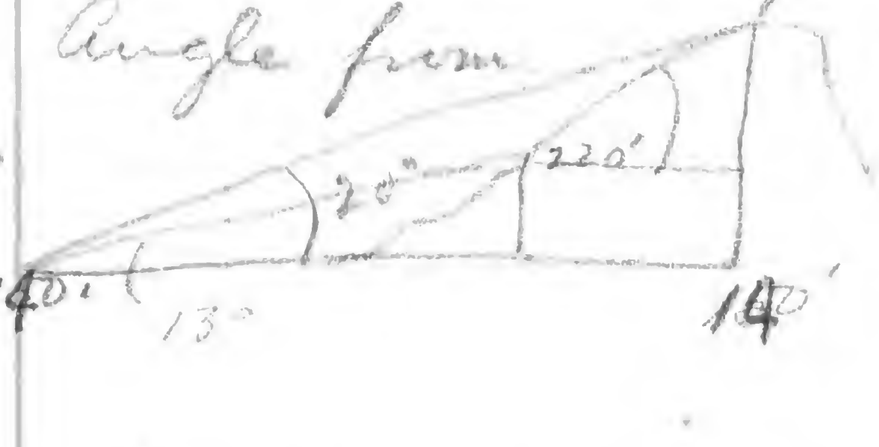
zone and has large productions in it. The same beds have been followed to a point where the ridge has been offset to the east by a fault striking N 30° W 65° SW. The whole east half of the ridge is backboned by Sp. pulchra.

PFs

Two ridges south of Fossil (type locality) are made up of Sp. pulchra with many Nyalinella and dome corals. Strike N 30° W 65° SW. The whole east half of the ridge is backboned by Sp. pulchra.

May 13 - Distance from Fossil Rocks along Composite Ridge to the top of high knob in plane is 1 mile.

Elevation at Composite Rocks is 140'
angle to top of high knob is 13°
" " top " " " " 200
Elevation at base of high knob 220'
" " top " " 415'
Angle from base of knob to top 40°



Large hill of Sp. pulchra

Strike & dip on the Composite Ridge summit N 60° E 45° S

The fault seems to trend N 20° W and the offset is small. It may cut through the east end of the small hill of Sp. pulchra since that is separated from the main mass by a small ravine.

47 Pictures 1, 2 on roll 3— views to NE showing isolated blocks in the alibe material. Final picture is of face of biggest Monzonite hill showing fault. Sagwaro points to position of fault.

At west end of marine unit upon Conglomerate bed. Pictures are the east side of a dike that runs through the hill near the west end of the low Pelona hill. The ~~[illegible]~~ Conglomerate bed is at about the same level on this side of the hill as on the east face, that is about half way up the hill at 200 - 250' above the plain or 150' below the top of the hill. The bed is much altered as it is in several places on this hill.

Collected upon Pelona beds which are not very fossiliferous they contain scattered large Pecten Ribs; Wagonoconcha (possibly Ostrea) and Dictyocloathus and a fairly large Chama. Upon Pelona beds these fossils are not silicified or were only partially altered.

48 PF6 - East face largest Mesozoic hill

PF7 - ~~Small~~ Knob just S of S face, ~~small~~ west end of highest Mesozoic hills

Many re-Cretaceous Drives with White and party. The anomalous looking of Baker is only about 2 yards from the base on which we are staying.

Afternoon hiked at section near the middle part N2 of the small a long sequence of beds striking N20°W and dipping SW which appears to be Pennsylvanian these culminate in the Conglomerate on the SW face of the hill. This hill is the highest of those just seen by me on the previous trip in this area. Crest of the small hill is 7 feet SW of the large hill is a small outlier which is composed of less than part of the conglomerate.

The next knob south seems to be pre-Cretaceous and is separated from the other hills by igneous material. I saw a few basaltic type. Next hill south again has conglomerate striking S35°E 30°SW. Mineral coating is on top of conglomerate

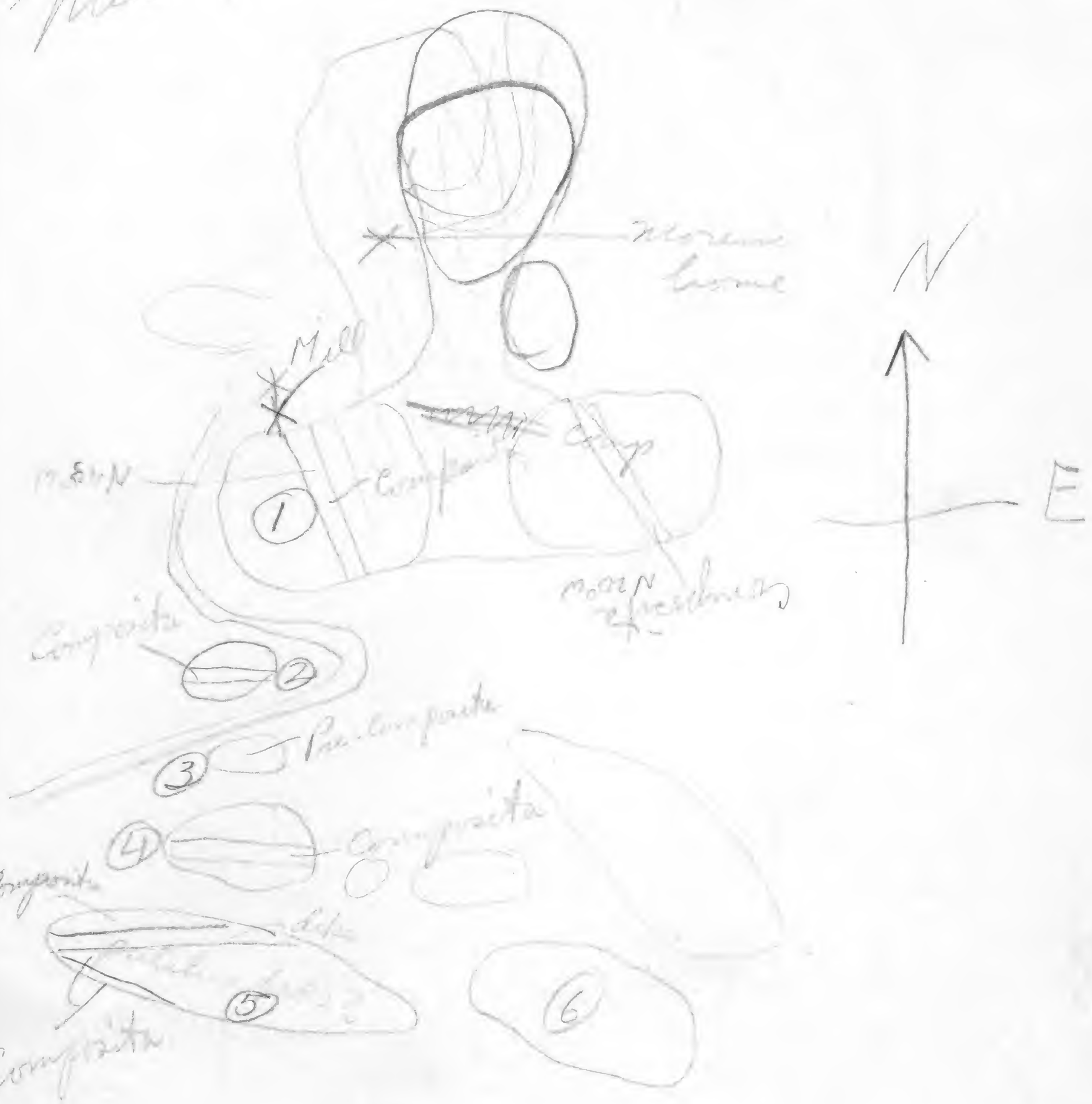
49 On hill 5 I went over the section
heading. The beds look like those
of the Chilcoma Zone — On the Eastern
part of the hill 6 I went through
and broke. Also a fair number of
possibly silicified Ammia or Nymphe
on upper part of Hill 5 small
shrubs and Ceanothus are present
with small Dicoma and Haplocha
I think the beds of both hills
5 + 6 are Pulcher Zone. On the
north nose of hill 5 the Conglomerate appears in a small area.
Also found Spirifer in a just S of
the Conglomerate bed.

PF8 - Southwest face of Hill
just SE of S of hill, about 2 km
NNE of El Centinela.

PF9 - North side Hill No 5,
about ½ mile south SW of the
mesh NNE of El Centinela.
Pulcher beds.

An explanation for the authors
of 2 Conglomerate beds on hill 5 can
be explained as a slice of
Conglomerate overlain by Pulcher
or Sandy with fossils, cracking
and part floating off from the main
mass. This would be the small
block on the NW side of the hill.

Mill Hill


Mill
M & N
Composite
1
Composite
2
Pre-Composite
3
Composite
4
Composite
5
6
E

50

May 15 – On the east face of the hill due south of the Morado home near the mill I saw 10-15' with Campanita, big Nipaloneilids and fair-sized Aromia. The fossils are not as well silicified as in the Campanita Zone down here. About 60 feet vertically down to the very crest of the hill the rock is this S' and the jag with the scalloped dark brown chert at the top and slightly below it are corals, pure Nipaloneilids, Aromia characteristic and lower Pulchra Zone. These fossils may be collected on the crest to the fault strikes directly through the crest of the hill and the Campanita beds. The pulchra beds are rich in coral and brecciated on the side near the pulchra beds. On the east the pulchra beds strike N 20° W 40° SW The fault strikes N-S and cuts about through the home from the crest. The pre-Campanita beds strike N 43° W 60° SW. The dip of the fault at one place is 45° N 60° W.

On the hill just east of home where pre-Campanita appeared the strike is greatly distorted and the hill should be added to the map.

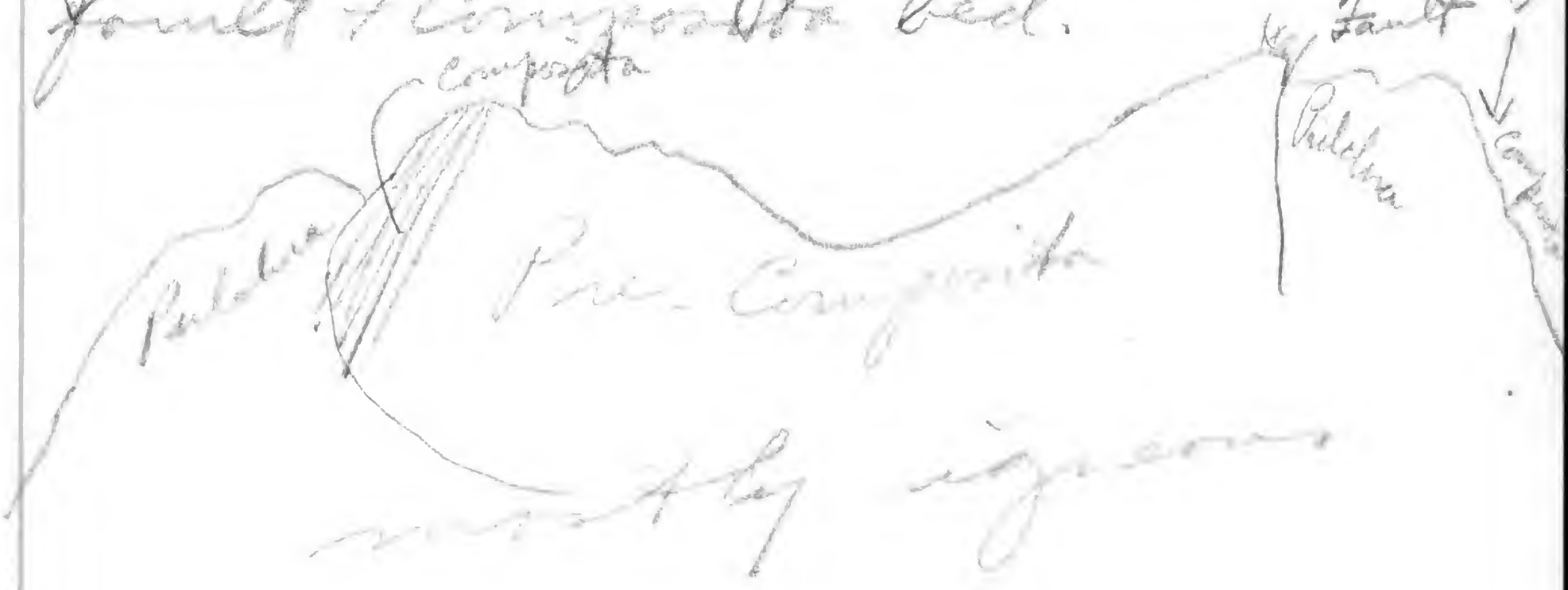
51

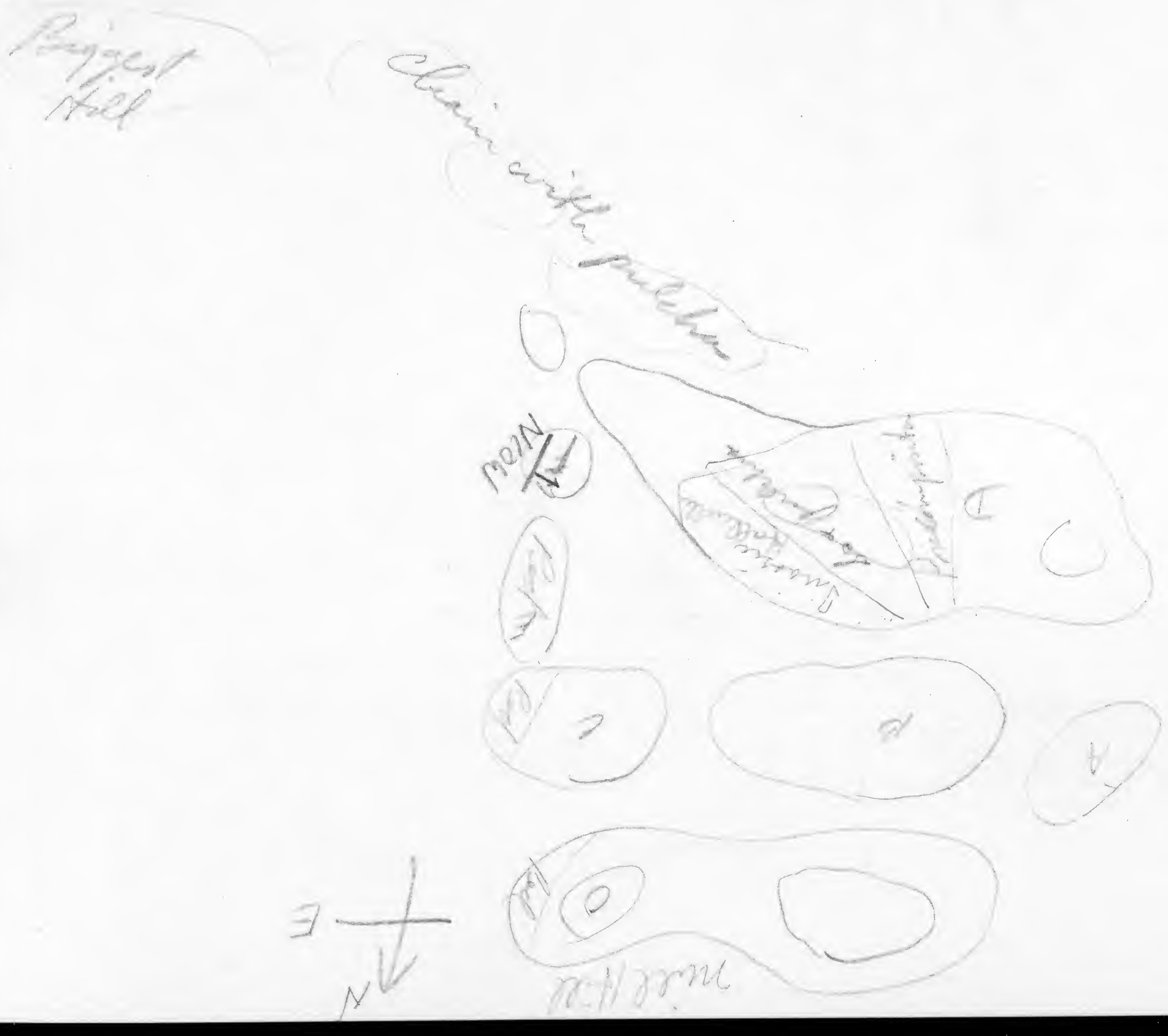
The lower Devil Creek beds appears on both sides Monument but one side is pushed N in relation to the other by the N-S fault through the east end of Devil Hill. The beds contain, not well defined but contain Ribstage, Dentia, Neopinna and Wagencrinus. Here are three definitely Carnian and if they belong at the base of the Augusta then all the beds are Carnian. Above come chert, thin bedded lo, thin-bedded chert and dark gray lo. Next a thin reddish and green Triassic red beds.

~~Devil Hill at the Nicholas school~~
~~San Francisco~~

No

Pachuca 576 on pack 3 - Panorama of south side of Mile Hill showing fault & Augusta bed.





52

Large hill south of Mill Hill is mainly upper Kibbra and has large Elmo + Kellerglum. A low hill going NS connects this with the large hill D. This consisting hill (E) is mostly of red siliceous shale and sandstone pre-Cambrian as seen east of Moreno Trail. On east slope of E are some green limestone suggestive of the Triassic.

Hill F is red with spheroidally weathering ss and platy shaly fracturing ss.

7, 8, 9 on pack 3-7 Mill hill from Triassic hill (D); Moreno hill from hill D.

10, 11- isolated blocks SW of mill

53 Big Fissure hill lies on east flank big mass of Pulchura Ls. with a small knoll of Fissure on its side. Here in Lr portion of hill is a block of thin bedded pk - Composita, also some Zor NW flank SW flank of hill is pulchra Ls at top nothing down through Composita into Pa - Composita

On SE base of hill D ocean about 40' of rock, black to nut chert and containing Schizodus and Rellerophon. Similar limestone occurs on the S face of the last first S of the biggest hill. The rock is somewhat shaly, dark gray & weathers light gray. Of about ten species collected Productus Symmetricus is abundant

May 16 — The Fissure Hills form a crescent with one end of Spanish Peak and the other forming Valley ending in the Mud Hills. The hill like the last where the Fissure stands. A big hill facing SW and from which SE Cochiman can be sighted S 35° W forms the outer end of the crescent. The southern face of this hill beautifully shows a fault contact between Permian above and Fissure below. Here the Fissure can be seen to rest on

54

foothills and as one proceeds in the section towards the contact a thick breccia appears in which are fragments of Jurassic and rolled Permian material. The general strike + dip on this portion of the front is N5°-10°W with steep dips to the east. The actual contact can be seen and the Permian shows some brecciation and passage. The Jurassic is truncated all along the front with veins occurring near the contact.

Above the contact at this place the Permian strikes N10°E and dips to the W. The Permian is also the lime fossiliferous & with dark chert in abundance.

Going NE through the block one finds it cut by a thin slice cut by a slice which separates the outer Paleozoic zone with small rhyncholellids from the next slice which strikes N20°W 45°SW. On the outer part of this slice and some distance from the front indicating both Paleozoic & Mesozoic. This slice is cut by a N-S dike in about 10' and we have a third Paleozoic slice with Rhoetic. Strike N20°W 47°SW

This fourth slice is separated from a fifth by a wider N-S dike. The fourth slice gives a long

section down the dike contact face to the NW and one goes through the Composita Zone into the Pre-Composita beds.

The next or 5th block is a bay one of heavy-bedded, chunky ls. with small and large productids. Small thin Pre-Composita. A sixth small one of very thin bedded limestone is also assigned to pre-Composita. Between 5 + 6 is a gap that divides the hill into two parts, as usual the gap is a N-S dike. Just SE of 6 is a high mass of Pennsn. East of 6 is a small knob of smooth gray, red weathering limestone, brecciated on the top and with pebbles of Pennsn rolled into it. This definitely underlies the Pennsn. Just S of this Penn. knob is a small natural bridge in the breccia material.

On the NE face of this hill the Composita bed appears at about the same level as the highest peak of Mill Hill. The zone seems not so thick nor as well silicified. It can be located just S of the small peak of Arbuckle just above the brachiopod beds and 30'-50' higher.

40' vertically above Composita small rhynchonellids, Productella and Orthis occur. 63' vertical to crest where a good exposure

56 of brown pebbles was collected: Diplasina, Rhaophorus, Waagenoconcha, Spirifera, Dictyoclostus (common but poorly preserved), Aviculopecten etc. Plus a steadily dipping strike N 15° W 45° SW ~~The entire section~~ Dip think 50' at varying gradually from Composite to crest.

On the NE corner of the hill a Composite seems to have broken, and tilted Hillocks up to the North about 10' of a brecciated shaly zone. Just above the shaly zone I saw an impure Waagenoconcha and one of Rhynchopora. There is also a distinct difference in lithology. Although the Diplasina in red shale which is of a much brittle texture and sandy shaly material. It's prevailing color is red. The Pennsylvanian on the other hand is highly siliceous, dark brown, often very finely laminated but compact. It may have contained fossils of kind to match the Diplasina does not have. The presence of the Waagenoconcha suggests Upper Part of the Pennsylvanian. The breccia zone is 10' feet thick approximately

My interpretation has apparently varied. Reexamination of this section with this produced a

57

Limestone strata at the head of the Hallowell Gulch called Hallowell. Also a point that the Algonkian sediments rest on limestone in age and the structure of the district is to be determined.

One Mex point was made by White in the suggested anomal Cameron - Finnegan contact in a small block already examined. This is the one that has some 50' of overburden. This limestone is under the Hallowell sediments

May 17 - On East slope of east ridge of Hallowell Gulch "Hallowell" 153' below Composita. Slope 24° Composita N 26° and strike N 10° W 45° SW. 82° vertically above the slope under the Hallowell sediments the rock is predominantly reddish purple with a few lenses of olive-weathering dark gray ls. Almost vertically above the Hallowell are brecciated reddish ls. as on the large hill seen yesterday.

Just below half-way between Composita and Dictyoclostus from bottom up. 8 M.F. steps of blocky fine-grained reddish limestone 4 steps to ledgy buff-colored rock of which there are about 10' then comes big Composita Dictyoclostus, Spiriferina fultonia

Hallowell — Composita 149' Base hill — Composita 265' Lowpoint 295' 560'

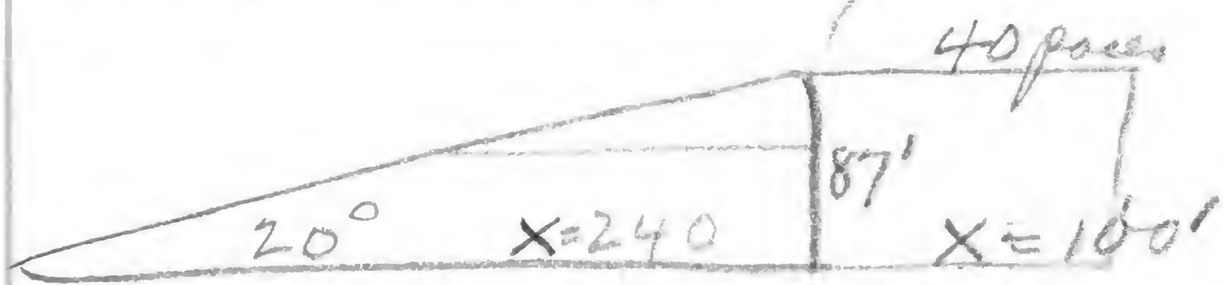
153 from Hallowell to Composita - Dictyoclostus

125 15.3 2 775 710 310 387

ST

And probably belong to Moreno Shale sequence.

4 steps more of heavy-bedded dark weathering rock to top of hill.



100' = 86' of section

Add the 40 paces also of massive dark weathering rock to the Thin-bedded Friable-Limerock at base of sequence on hill. Dip 60° Paces down dip.

N front Mill Hill near west side: Exposed at 43°, 51 steps from Hoffmeister (Hyalinella) to base of Composita. Also at this level found Unicalla ?, Linoproductus, Echinauphyton, Enaulopira, Rhynchonellids, and a few other species in thin beds of limestone through zone 20' of rock. Strike dip 40°-50°

This is about 190' between Hallorella & Composita

153
149
302

57 Traverse across beds in Basin.
Sight from starting point on
West Peak Mill Hill L N 63° W
Hill just east of Mesa - N 22° W
West End of east part
West End Hallowell peak - S 62° W
Top of highest Mtn (= S 57° E
Southernmost knob of Mesas - S 80 E

Strike & dip on Grand Peak N 7° W 50° W

1. S 83° W 33 paces Reddish mudstone with yel. bds.
S 83° W 17 " - black siliceous rock.
62 " - light gray, reddish ss.
22 " - fine grained igneous
114 " - fine grained ss, siliceous cement,
248 reddish spots - mud pebbles
S 57° E 60 " - Strike & dip N 2° E 50° W. Base of hill. - Slope L = 15°

S 83° W - 2. 4 HL steps ~~of~~ ⊥ to dip all in fine-bedded ~~7 HL~~ reddish gray sandy shale.
7 HL + 3' - top of small hill - Bluish-red moderately heavy-bedded to massive N 12° W 43° W. Lithologies: Igneous, Sedimentary O. Gray brittle chert yellowish orange weathering

Slope L on next small hill 8° 10 HL steps through massive dark dusty limestone into thin red shale on top 2 steps.

3. S 5° W. - 143 paces to base of small Hill ⊥ to dip; slope L 22° Strike N 10° W 60° W; 9 HL + 2' chiefly fine-bedded reddish siltstone and some red shale

4. S 10° W 76 paces

6 Small hill slope ∠ 19°; 11 Hb — thin bedded reddish limpet and thick laminated olive weathering

Strike bears N+S dips W about 60°

548 paces to slope bearing NE end of Hallorella hill. Slope ∠ to top of Hallorella 25°. Section goes S80°W

10 Hb shaly weathered reddish.

11 Hb to top of Hallorella

2 Hb in shaly fractured zone just above Hallorella. N25°W 60°SW.

7

Slope ∠ from top of brecciated zone to top of hill is 30°.

7 Hb - Thinly laminated compact lb.

5 Hb - to Conglomerate - dip 40°S 50°W.

11 Hb + 3 to East of hill

The beds between 7 Hb + 11 Hb are heavy bedded, more laminated with less chert than below and then chert culminates in the Conglomerated.

Small block just east of road about 1 km. Southwest 1 mile. Here is a block of blue gray limestone containing much coral about like that of the lightest Fulchina beds. Of this there is some 30' in one block. On the upper side are thinner bedded thinly limestone with strike N 30°W 60°SW. These limestones

61

are not strongly fossiliferous but a few forbids are present; Schizodus, Bellerophon, Spirifer? Area beds occur in this section the Triassic rest on the upper massive bed of about 14' in thickness of marbleized limestone that overlies the normal Paleozoic rock. This thick bed may or may not be Triassic. 30 yards of the Paleozoic are present. The strata is small and to the east but little into Triassic that forms a ~~section~~ dike to the north. The limestone is very fine textured but quite sandy. The Schizodus are common at the sandy layer about 8' from the massive layer.

213
256
87
126
384
220
770
2059

1628
1213
4
9284
1926
6456
12869164
13

137-184
184
321
160

866
213
598
566
8
1732
18458

62

1.

306 / 2 = 153

616 / 154 / 770

245 / 2 / 490 / 124 / 620

.766 / 620 / 15320 / 4596 / 474920

.766 / 770 / 53620 / 53620 / 589820

~~1 - 165~~

2

.268) 579 (220
536
430
430
0

.682 / 220 / 13640 / 1364 / 150040

11/5 / 53/4 = .268 = 57/220

.268 = 59/220

C = 59/268

1 - 5 + 2.
2. - 150 (F)
3. - 262
4. - 108
5 - 75
6 - 220
7 - 160
1517
542
975
Already Cut.

3

10 = 50/4

1405) 384 (54
4 2 7 5
11850
1240
6100

.684 / 384 / 27360 / 54720 / 6840 / 262656

Total thousand board feet = 2031
Cost of Hiding = 1405

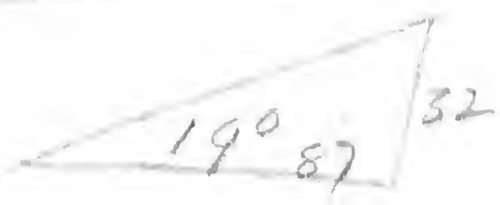
4

48 49 / 3

.4040) 5100 (126
4040
10600
5080
25200

126 / .866 / 756 / 756 / 1008

5



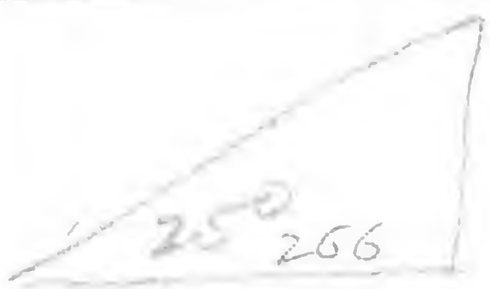
6 = 30 + 2

32

3443) 32000 (87
29554
24460

8660 / 87 / 60620 / 69280 / 753420

6

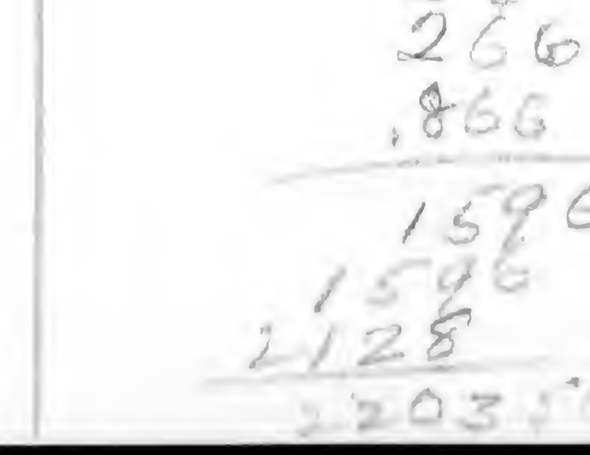


23/5 / 115 / 9 / 124

.4663) 124 (266
9326
30740
27978
27920

266 / .866 / 1596 / 1596 / 2128 / 230356

7



23/5

.5770) 12400 (213
11540
16420
2178
8520
5770
1750

63 Have Smithsonian write Letter of thanks to Sr. Manuel Lamas
Manager Morenos Mines
El Antimonio, Sonora

May 18 - Collected from lowest beds on edge of hill between Mill Hill and Ouige Mtn just S of Mill Hill. Saw the same fauna at base of hill NE of the Morenos house near the E&W road across the ~~flat~~ plain.

Have a fine fossil list:

S 30° E 508 paces
at 257 paces volcanics
at 276 - limestone lens and red ss.
striking N 18° W dip ? E
508 paces to base of ridge with
red Penn. Ls. much faulted & altered
quite distorted. One Ls. layer N 55° W
75° SW.

N 87° E 666 paces to base largest hill
at 125 paces red Ls. in Mesozoic beds
N 20° W dip SW.
at 160 about S 35° W up hill, the
lower part hill N 20° W dips SW. On the
saddle line the Permian
appears to dip under the Triassic
but the part of the Permian
shown is well below Carnotite
at 423 a red ss to have N 25° W
dip ? Station at 666 about 5 m line
west N-S igneous rock in base

2774
6948
3A68

64 N35°E - 550 Dolomite bench of dark chert 4 ft. N57°E dips steeply to S.

N87°E. 500

at 500 ft. is a 6 ft. block of Conglomerate 50 ft. under Lyons to ctr. top.

N88°E 520 to road.
S27°E down rd - 264 to W end
W bank of creek not 3 ft.

Map 20 - Abiquiu Formation
Coyote Creek Section
Red beds at bottom 145 m. Below
Composite Abiquiu Group 450 meters, a
possible total thickness of 595 meters for the
Permian

La Ventana is 10 km W of Cabra
La Ventana - Abiquiu Ls forms standing
On SE end of it is N13°W dip 54°W.
Direction of section about N65°W. Slope
L 25°?

4 Hb - light blue gray mottled, light gray
dolomite.

11 Hb - dark gray dolomite at bottom
becoming lighter at top with
occasional thin layers of b. dolomite
often mottled & banded light &
dark but whole interval mostly
dark.

10 Hb - Dark and light banded and
fine-bedded ls. & dolomite

64 6
2 50
1 98 3
594

65 — 22 HL — Light gray weathering heavy bedded dolomite showing thin bedding laminae which are often wavy.

8 HL — Dark gray massive dolomite becoming less thin bedded in its 5'.

10 HL — Light gray banded dolomite with yellowish weathered banding surfaces but have small irregular light gray patches suggesting fossils.

40 HL — Dark gray heavy - bedded dolomite

7 HL — Dark gray fine grained with a little banded dolomite containing small "eyes" in rock. From outcrop paced 53 paces to brink of Pickerel Creek. Total height by HL. 112 HL = 560 + 47 = 607' By barometer 565'

Drove up Portage first hill to where bottom of canyon is 475' drop. 190 paces on slope from top of dolomite to stream. Portage slope left for the 190 paces occupied by steel gray dolomite that weathers to a dark gray or black color. The 190 paces are occupied by.

Create 1923' for thickness of lower dolomites

65 / 4663 / 12 11'
SS 1870
HL 9326
54 5490
40 4620

(731 / 619 / 1923, 554) 100 / 53 100

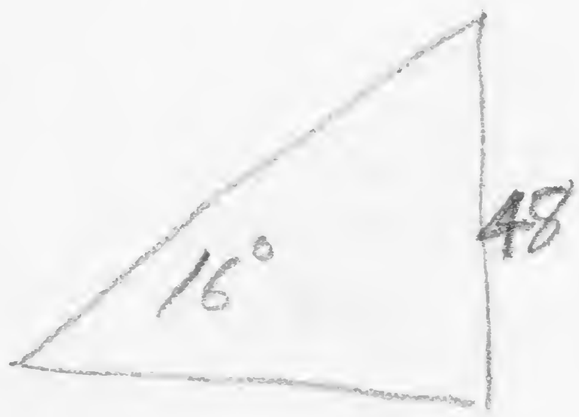
3 SH / 6 17/24

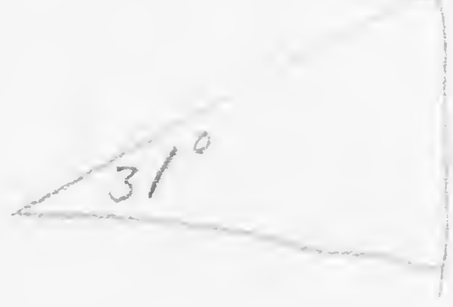
11 2 90

20420 / 19382 / 10380

(494 / 475 / 45458 / 20420)

731 / 1 11 2 / 619


16°
48


31°
17'

6C section from middle of bluff east
Bluffs at 30°. Section should be
added in inches & order to the
dotted line. Slope ∠ 31°

28' 1) 3½ - Thin - Faded gray to yellow clay &
3½ 2) 2' massive bed of sand & with
orange-yellow clay spots.
36' 3) 4½ - Thin faded gray shaly &.
8' 4) 5' ~~---~~ massive bed
18' 5) 2½ - Thin bedded shaly &. Thin may
be the horizon for the fossil bone
bed.
56' 6) 6½ - Thin bedded gray shaly &. Over
2' massive bed dark limestone
with orange yellow
95' 7) 5½ - Thin - faded shaly &. Strike
N 20° W 57° E. (obs. p)
11
8) 4½ Heavy bed of limestone making
in a rod foot yellow zone
containing fish fragments
45' 9) 5½ - Thin bedded shaly sandstone
slowly becomes
19' 10) 2½ - Ledge of massive limestone
which thins me to the point
on which the obs. is eight
miles to the west. Here the
ledge and the
great mass of dolomite is
quite a hillside shale which
must be measured separately.
The dip is ∠ 10 15° and the height
is 30'. The section is mostly covered
but massive red crumbly shale with
limestone exposed.

Measurements
160
120 18
39820
36054
37660

(112
B = 11

2680/30
2680
3200
2480
6240

.6009

2676'

1 — 25

2 — 2

3 — 37

4 — 7

5 — 15

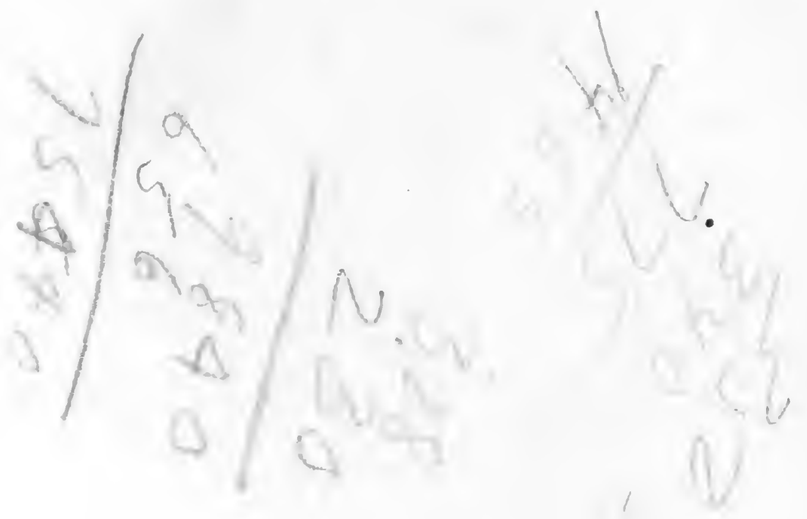
6 — 50

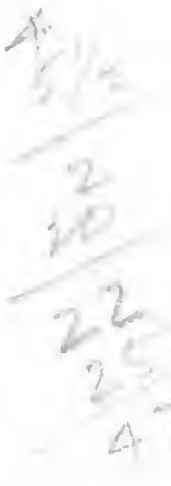
7 — 42

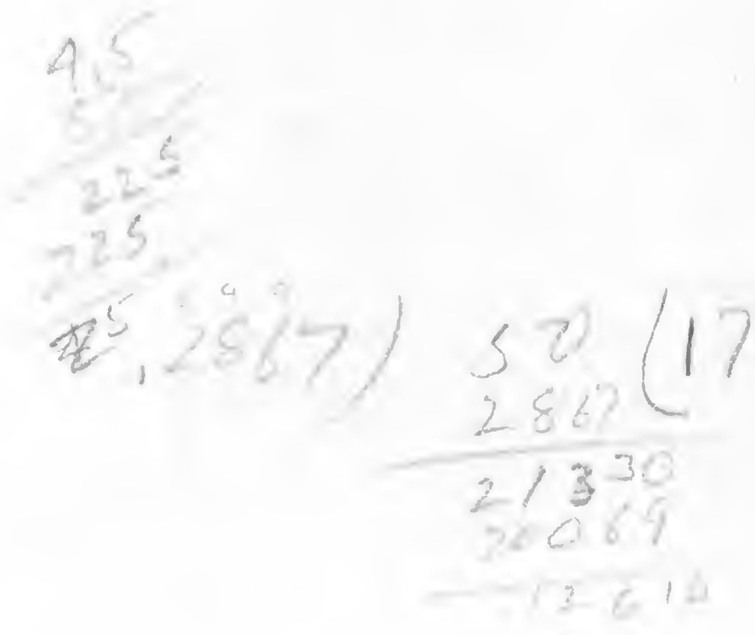
8 — 34

9 — 42

10 — 7







K

Quartzite 116' Not Complete — J

weathers to base of ledge. Not effected up prominently. Color to Top Ledge ~ 160

4 Ht - Thin sandy red shale with calcareous concretions

240' — I'

4/2 Ht - coarse sandy platy shaley limestone with fossils (Brachiopods) 52 (174) 25 148

Marine 350' — I

Thin zone contains many fossils like preceding

21 320 076 12470

330' — H 90

Covered

43' — G - May 21 - Took 3 pictures, 2, 3, 4,

No 147' — F 2 shows view to NW showing Sagbach ridge, 3 to NNW shows Ridges in valley on north side Mtn., 4 details of E, showing shale under Nisk ridge E.

Marine 15' 18' — E

174' Red at top Cabbage — D

Well Nabengaibges on N side divide from Dakeian section could be walked from top of A to at East base of Ivanay limestone to west.

166' shaly Bx. — C

Pace distance between E and bed 10 of page 66 - Slope ∠ 14° - Total height 76 paces + 6 ft to a 2' ledge bed 10 146 total pace to Bed 10, Total height to Bed 10 about 22' thick.

Red 112' shale — B

1923' Dolomite — A

Bed 10 - Top (or base of dolomite) slope ∠ 27°
Barometer 155' - 210 = 55'
Bring Thickness of div. R.

4391' — total

Bed 10 contains rocks like what is at the

68 yield orange-yellow spots. Also pisolites.
Section from E to the west through blue canyon
Strike + dip are E-W N 7° W 73° W.

F - 59 paces. Top 18 paces is red sandy shale. Lower 41 is platy yellow weathering shale by limestone band 7 paces wide occurs just under the red shale which is more massive + very yellow and makes a conspicuous yellow band. Beneath the yellow band the rock is thin platy ls. The conspicuous yellow band is fairly heavy bedded and very hard. Beds 4-6".
About 9 paces of thinner platy yel. ls. plates. Then 10 paces red shale
The remaining 15 paces are cobbly to platy ls. a thin granular band 5 paces west of E produced a few Tilobite heads.
The 7 pace band of yellow consists really of 1 foot of yellow band to the bottom + 6 or 8 inches of shale in between. These 7 paces should be added to the red shale.
The red shales are very micaceous and seem to have been considerably altered.

59
2
118
29
147

6- 9 paces of olive gray smooth weathering limestone with blue to blue gray cutting. Some

420

69

Tapeno weathers to a bright orange yellow to light brown color making conspicuous patches on bands. 4 places west of G the rock is soft Then comes 6' of sandy limestone. This ~~H-140 paces~~ should all be added to G. as it seems to make one bed. It would then have a total pace of 17 paces.

34/9/43

H - interval 132 paces. 132/2 = 66, 66+66 = 132, 132+132+66 = 330

It is difficult to make out a section here but alone G there are 16 paces in thin platy ls.

70± paces sandy, limy shale & shale with occasional fossils.

46 paces in platy ls.

I - 140 paces to west end mountain, 70 paces additional or 210 paces to shale or quartzite contact. The 70 paces are evidently ls & shale beds above G. 66 paces to base of quartzite. Thus the I. are 140 paces

140/2 = 70, 280+70 = 350

I' Formation 136 paces 136/2 = 68, 272+68 = 340

J - Quartzite 275 paces. Picture 5, pink quartzite Contact. 275/2 = 138, 550+138 = 688

Red I — Massive layer of dark limestone containing many bands of inguntic, irregular calcite veins, a little dolomite & some marble & light color showing

flow structure. Black eyes & white
70. common. Some small white crystals
of brown color. Strongly resembles the
Lujoba of the Arroyo Hills and of
Antelope Creek to the

Bed I' - section from quartzite to
black lines Flat, edge on limestone
ledge. Taken at divide on W. side.
A + 9" dark brown sandy ls.
B - 3' platy ls
C - 2' Laminated ls.
D - 70' moderately heavy bedded platy ls. 31'
E. 57' - Thin-bedded platy ls. 23'
Dand E passed up a slope of 10°
F - 8' hard massive ls forming with
G) H. a thick ledge. Outcrops
black and dark
G - 10' - cobbly limestone light blue gray
H - 13' - hard thick bedded limestone
ledge forming a steep ridge
Contains many irregular masses
and the "eyes" on joint faces near
the top.
I - 18' thin-bedded fine brown to white
ling layers of Calcarella.
J. - 8' massive oolitic to pisolitic ls
K - 23' - thin bedded platy limestone
with trilobite fragments.
L - 10' brown sandy shale with ls
lenses of Calcarella.
From L up to P we go on a slope
of 17°.

Measured by B.S. Keefer
for parallel slope
of 10°.

Bed I' is top of Lujoba

5-70

71-9

M- First 30' up-section slope is thin bedded flaky limestone culminating in a thick ledge of massive rock.

N- Next 13' up slope thin-bedded calcareous brown sh. with limy lenses having oyster plates.

O- 6' of slope in yellow weathering sh.

P- 20' of slope in blue gray cobbly & nodular limy shale with big black concretions. Rich bed in adjacent to the main mass of this more limy than the main mass of I and therefore have made a slope away from the ledge.

Most of the beds from A-P contain fragments of fossils. Except for the Salterella I have no good complete specimens.

Section in Quartzite
Elev. of Barometer at contact 500'
20 yds W of contact is a 5' bed of brown weathering dolomite. 198' from contact comes a bed of green sandy shale that I estimate would be about 100' thick. This is followed by thick limestones. The first ledge is about 10' thick and is followed by more sandy green

.3057/6114
7860
6114
17460

Desert Mts 1855-1
From the Quartzite
Ledge

72 Thick ledge

This thick ledge

shale ~~about~~ and sandstones about 75'± to another heavy massive ledge of limestone. Barometer at thick ledge 325' representing a drop from the contact of 175' Slope ∠ to contact from thick ledge 10°. This equals a thickness of subsite of 905'. A chain of 4 men & Bill Simms along the strike of the beds and one probably 4 (Data) for lower part and on level ground the slope ∠ # 190, vertical distance 300' I also paced off total horizontal distance. This triangle = 821 feet horizontal

from

Section going east from ledge of plain 75' back of quarry site. Sedim (dip not in view) also. Slope angle 23°

19 paces to lowest outcrop.

Lowest rock a thick ledge 6' of hard massive light gray marble-like ls. separated from another by a few feet of shale. Men following green shale on the slope to the top of another ls. Contact of shale & ls. is 50' above plain level by barometer. Barometer registers exactly 105' at top of thick ledge.

Section paced from ledge to bottom of notch at divide: 59 paces average. Last 29 paces in red shale & sandstone to ~~top of hill~~ brown limy ss having calcite and limonite. Last 29 paces on level ground

A = 247
B = 147
C-F = 314
G = 89
H = 310
1097' A

247
.4245) 105
8490
20100
16980
32200

59
2
118
29
147

B

1097
- 35
1062' for lower part replaces

B408

5380 / 2550

417 / 9 / 3753 / 417 / 83

917 / 8 / 3336

2638 / 3336 / 35645

263 / 96 / 311

B

C

D

E-F

G

H

Interval A is 20' thick with a footage of 20' to the
Next hill slope ∠ 24°.
At 50' up Saltzella shale grey to yellowish grey Ls. containing
Liquella & Lingula fragments.
At 65' fast the platy yellow weathering
rock gives way to
At 140' ended top of section, a 20'
bed of medium bedded blue gray Ls.
in which fair imbedded angular bits
weather to a light orange color.
Between this bed and the platy
yellow Ls with Liquella are
blue gray Ls and yellow clay shales
all abounding in fish bits, Unfortunately the rock is so fresh
the fish bits cannot be studied.

Altitude Formation 4

Thick platy Ls, 2' massive
with banded Ls, 14 paces
platy Ls, 6' thick banded brown
and dark gray Ls, 9 paces platy Ls
but 5' yellow weathering Ls on weath
8' ledge of medium dark gray, yellow
to cream Ls. Rise begins to flat
hill with slope ∠ 25° and height
55' up quickly grades to about
edge of section, 1/4 bed.
75' evenly bedded sandy shale
105' massive bedded sandy Ls.
125' green shale
145' massive Ls with quartzite
layer at the base. Rise in contact
of quartzite and lower Trivia beds

Interval 125-145' placed in quartzite sequence

From the 43 there are 20 paces to another bed with 1' quartzite at base and thickness of 6', alternating are green shales. The may be same as preceding bed but offset to east. An offset of a quartzite ledge like the first 43 is in the distance but not seen. Probably this 20 paces should not be added. His upper bed was walked to the end of the ridge and crossed OK and paced. The quartzite from it.

310 paces across quartzite ledges outcrop. Quartzites are green in fresh & dark rusty weathering ready = 775' at for the quartzite.

After lunch came back through quartzite to see the shales. A big shale slope occurs on the west side of the easternmost limestone bed probably 75' of dark arenaceous shale but could no fossils in them. This is true of the shale bed on the opposite side of the same ls.

Picture 9, pack 4 - Quartzite-Ojota
" 10, " 4 - fossiliferous beds W slope
part of Pic 9 probably from the
Ranger agency in Ignacio in
which the Mesa Fa Formation occurs
This has manifold some of the
cracks. Sand, for example the
two small white hills on each
side of the road on the east
side of the pass.

Fieldwork
Quartzite
310 ft = 620
x/2 = 155
775

775'
+ 43
20
638

Drive from 20, 21, 22

310
3

3,28
310
9840
3280
984
101680

273 m
3,28

2184
546
819
89544

3,28
2,70
7'9840
756
850,70

415
3,28
3320
830
1245
136120

75

Hagerstrid Distances on Laureadra
Alberto meeks division A as 415 meters
" " " Reg. B as 310 "
Albert is figuring his Kilometers on
the basis of a dip of 70° the dips
seemed steeper to me. Compass figs

A' = 1361 feet 1456'
B' = 1017 " 990'
C' = ~~310~~ m. = 230m
D' = 273m
E' = ~~272~~ 272m. Total 1500m.

Soft slope on down (to top) of El Jaro and at
about 84° W; and 83° W.

over

May 21 - Small hill N 23° W of end
of Laureadra ridge
N 23° W 1387 paces, small outcrop of
hard massive brown baked Gab
compact, thick to Jurassic Gabbro.
Strike N 18° W 17° SW. The most
important feature of this outcrop
was dark laminated masses of Ain
which formed well cemented thin
to thick part of the sequence
one or two feet wide & two or three
feet in length roughly flow
2-4" of calcite and pinks to. The
beds are thick laminated and
the laminae and many of
which thin after quite thick.
Flows could well be the California
reefs of the real depth.
Bed rock at this hill is a low
ridge of rock. The ~~Calcite~~ is mostly
Calcite containing many calcite
veins

Orellano figures on Surveyor

A — Trem — 415 m = 1263'
B — Arroyos — 310 m = 1017'
C — Jacobs — 230 m = 754'
D — Granite — 273 m = 895'
E — Westerner — 272 m = 892'

Total 1500 m = 4821'

Copper figures

A	—	Trem	1456
B	—	Arroyos	990
C	—	Jacobs	690
D	—	Granite	771
E	—	Westerner	1062
			4969'

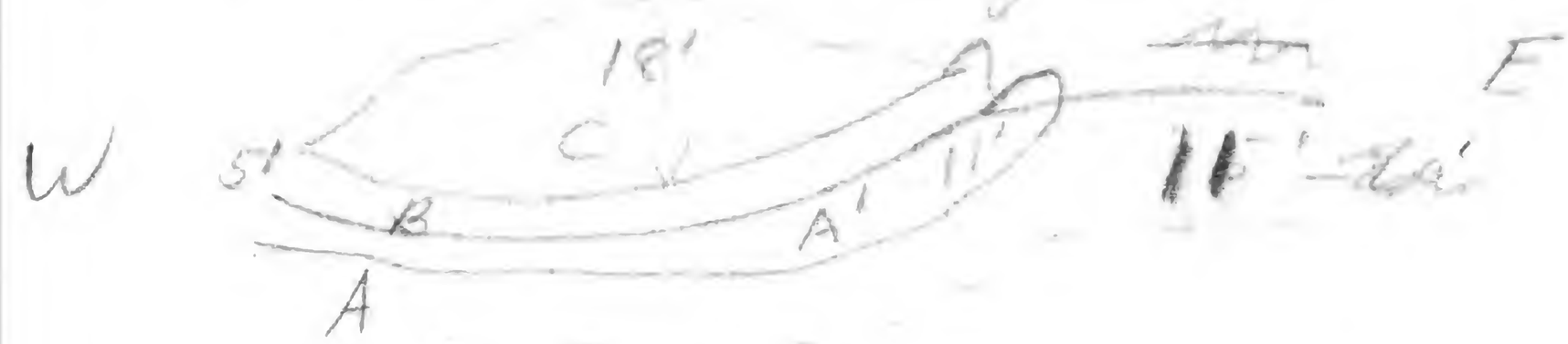
+ 95'
- 27
- 64
- -124
+ 170
- 215'
+ 265
+ 50'

Final figures Jan 30, 1950

			Diagonal
Trem	—	1312	
Arroyos	—	1018	1116
Cerro Prieto	—	329	333
Buelna	—	398	225
Procedera	—	732	887
Cueva	—	961	950

76

N60°W 1270 paces Yoam Flow small
butt. Light on W end to Protection
S45°E. Light on W tip of El Jem of
Cerro Lobo is S2°W. Low hill between
head each gorge. much coarse
Bay called N40°E 5D°5E of the 4 ships.
Light on Segovia N17°W.
N55°W. 1500 Small aqueduct

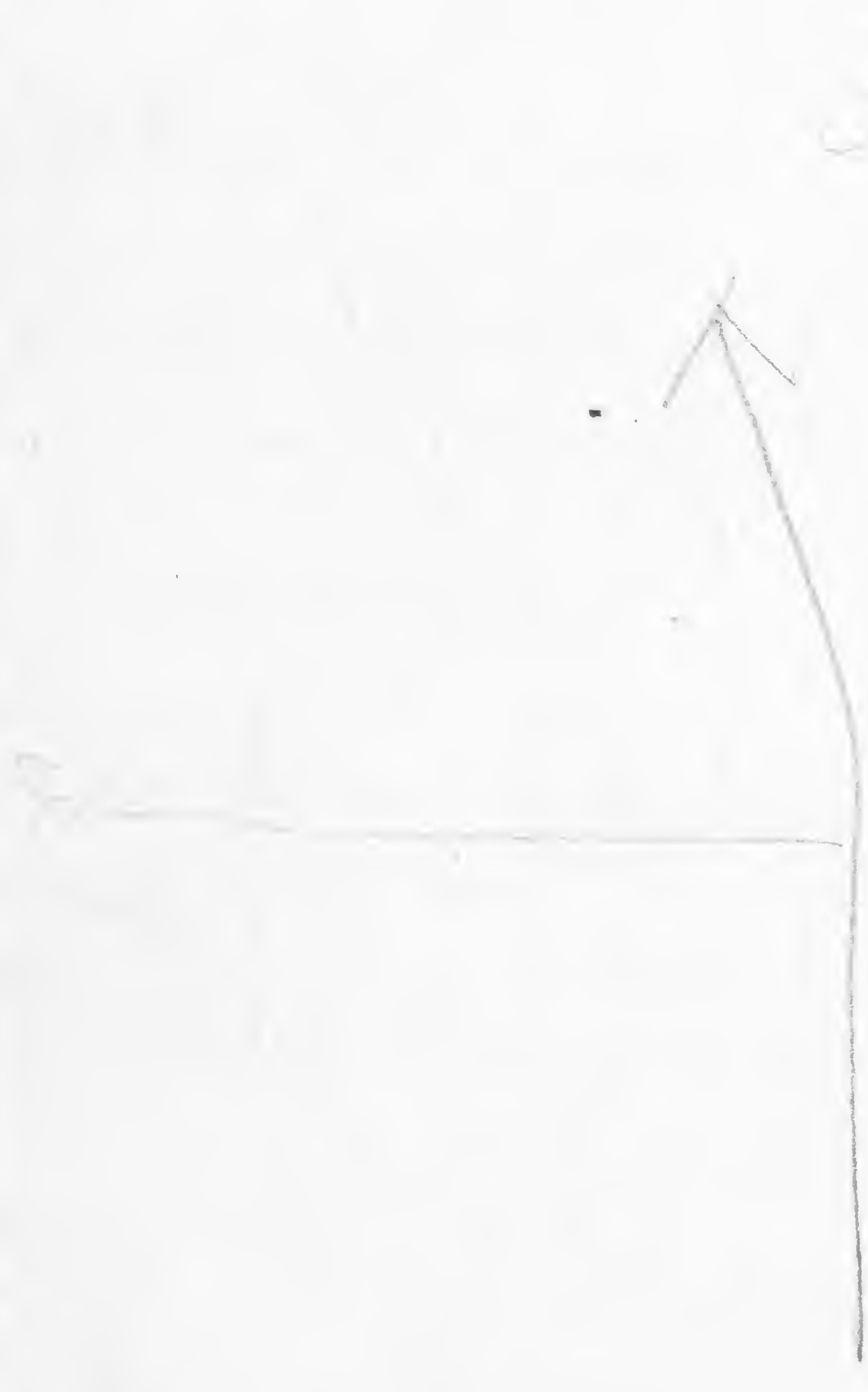


A' — massive dark quartzite 11'?
A heavy-bedded sandstone.
B. shaly fine-grained sandstone, flow
C. Massive quartzite, forms bar

25' 4-5 at at 170	G
4 at 20'	F
3 at 15'	E
1 at 5'	D
3 at ps 15'	C
2 at 10'	B
3 at ps 15'	A

Light on W end Peninsula S48°E
S48°E 4500 paces to W end Peninsula

May 25 — Collected ref — N45°W 20°SW
on Pan Isla — also H ref.
A — heavy-bedded sandstone.
B — covered
C — Heavy-bedded gray to massive
shaly-sandy fine bedding.
D — Thinner bedded 6-8", detrital
Lo. in the valley. Fossil fragments
E Thin-bedded fine sandy Lo.
zone of it pinks in color



77

F Collenia reef.
G - massive grey ls. with calcite veins

Light on Sapper's cove N27°W.
Although Collenia made with compass at 250° (by casing) Post Collenia reef at 170°. Abbott discovered a probable Eucharcyathid.

S75°W from granite hill 1775 paces crossed long low bridge. Strike N22°W25°NE. Huge cave, whose entrance 141 paces and one capped by 11'of same kind of limestone lying nearly horizontal and forming a small mesa. The beds thin bedded alternating light & dark gray much brecciated & the south end. The limestone suggests other fossils as El Fen more heavily the latter. Here more is bordered by the N by basaltic rock and a low cliff of the same overlying rock to the south. The dip between N 12° in the mesa-like top

78

Eastmount of 2 Sapeo Hills
Slope ∠ 18½°

A – Heavy bedded lt tan and brown
Sandstone N43°E 50° NW
Recessive on ground like to 85'
Sandstone Thickening in line with Segment B

B – Thin bedded to. Section proper 53 feet
in Thin Bedded upto 2" Fine grained
Limestone. Barometer at 100'/
A few Tibetite, 2 pieces above ground
Saltwater immediately B. Near the
top is a thin sandstone Unit covered
with Tibetite fragments.

C – Massive limestone light gray
much calcite veining
Barometer at 125'

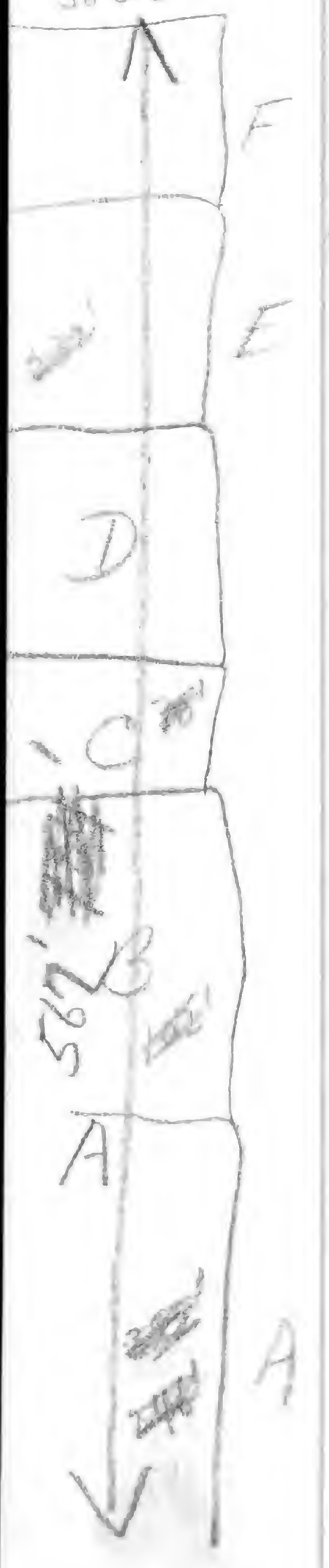
D – Yellow limestone, thin bedded
With a small unit of ss. Saltwater
abundant in lower part, Tibetite
common at top.

E – At base Thin bedded ls with
black bituminous ss, nearly
covered by debris from upper ledge.
Barometer 180 at top of this
interval which is at base of
cliff of massive ls. The thin
bedded 3-4" ls appears under the cliff

F – Massive gray ls. many small
calcite veins, Barometer at crest
240' ~~passed through~~ [illegible]
Slope ∠ on W side North 37° to base of cliff

740
.3249 | 240
22743
1257 0
9747
3

.7660
740
3064 00
5620
566.84 60



79

One ledge much of the limestone is fractured along vertical joints like this one. Some of this joint is filled with fibrous calcite in veinlets a few mm wide. The limestone looks like that in the knoll N65°W of the cabin.

The long low ridge where the flowers lie is like most of the outcrops of this member (East Sapinero)

May 26 - Examined rocks on divide and hill to north of old road to Pitkin to east of Cabin. The hill is largely a dip-slope of the limestone bed and underlain by limestone shale and also with an igneous material to the north. A thick slice of this material is of Cambrian age because of the material enclosed in the Cambria not have been eroded in. The limestone are flat-lying often weathering pinkish, with sand and rocks. Stromatolites similar to this also occur. The shale are greenish gray, very sandy and have "fail" like markings. In addition to the lithologic

	evident & found two specimens with possible Tribolite fragments. Dip 340
600' A	West Sapona hill - Slope ∠ 19° Lowest exposure about 8' gray ls with calcite veins & possible ref. To top of quartzite 273 paces and Barometer at 160'
B	31 paces W of quartzite contact a 2-3" with Antony Bedrock, 58 paces total of thin bedded limestone in beds 1/2 - 2" thick. Barometer 200'. Thin Tribolite organisms at top.
C	About 4' massive ls.
D	- 67 paces in thin bedded ls. like that below. Some Tribolite fragments Barometer 225'
E	- 20' heavy massive ls ledge steepens here & the ∠ is 29° 80 paces light blue and yellow platy limestone. & Tribolite present near top. Sulfurella abundant below Barometer at 300'.
F	17 paces massive ledge of moderately heavy bedded yellow brown weathering ls. Barometer at 325'.
G.	45 paces to top on light blue gray

.3443) 350 (.1013.
3443
05700
3443
12570

5592
1013
16776
5592
55920
566.46776

23
2
46

1013
57
65

600

.5317) 350 (656
31902
30980
26585
39450

.5592
1070
391440
55920
598.36440

May 27 - Spent morning
trying to make arrangements
to get boxes shipped out
of town. Finally
arranged and the boys
left about 10:30.

In afternoon walked to
steeply dipping rocks on the
north end of the chain of
hills on the SE side of
Colorca. There are small
altered ls. ph., and ss.
but mean the logs on the
west side, in a while
bypass and a few of
formed Salt Lake which
gives me good evidence
taken with the Antelope
fragments found higher in
the section on May 26th
that the whole sequence

which runs the several hundred feet thick in all E. This definitely puts Babe's Cabora group in the Cowt in the Pennsylvanian where he had it. Strike N 68° W 30-50° S.

May 28- Left Cabora at about 9 A.M. Mexican Hwy. After going to the about 15 miles east of the east prong of Alegnitz. Low rolling hills about 2 miles SE of altar we stopped to look at the rocks which are mostly greenish fine grained schists that contain small fragments of shists containing quartz and limestone. Some of the

latter strongly suggesting losses in the E. It is my belief, without any evidence other than lithology, that these rocks may be more intensely metamorphosed than the E.

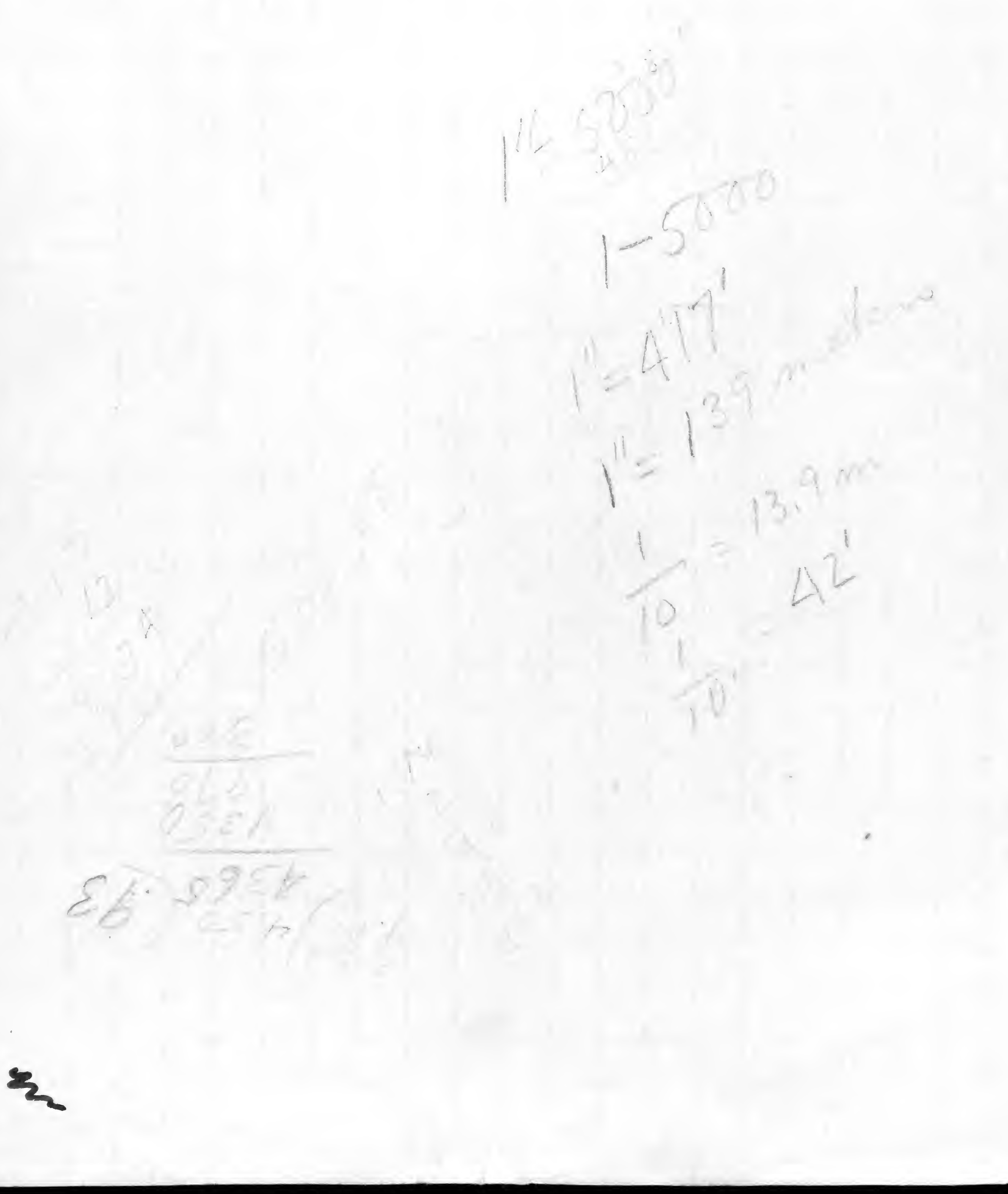
89 shattered with many calcite veins
Barometer at 350'
12 on pack 4 is of Proveedora
granite from W Bayoo.

23 paces to W brink of crest and
that must be about 200' thickness
to the West.

Here N + NW of this pack are
many of these that have had
many acres of the Paleozoic
land seem to have up with Bayoo.

2 Slope < or west face 28°
There is just ¼ mile between E & W Bayoo

Hildegardo Badilla. S.
Cabarca, Sonora.
Avenida D, #19 North.



Notes
Mexico
War — Speech
1944

(1)

Sonora Feb-April 1944

February 19- 5
Left Washington 40 minutes late on the Dixieland scheduled to leave at 8:20

February 20. 5
Arrived St. Louis at 4:30 exactly on time. Left St. Louis 6:50 on Sunshine Special. Scheduled departure is 5:50 P.M.

February 21 17
Day without event but train getting progressively later. Arrived at border about 2:00 A.M. Inspection took about 2½ hours. Left Nuevo Laredo at about 4:30 A.M.

February 22. T
Continued to Coa fine but trip fairly pleasant.

February 23. W
Arrived Mexico City at 10:15, nearly 15 hours late. Was met by Abad who took me and Mr. Lindsey to Hotel Monte. Have dinner Mr. Lindsey's room for the night.

Feb. 24- Th
Started arrangements for leaving M.C. Lunched at Fortinos with Lanabee a U.S. geologist. Afternoon went to Rodeo Bazaar. Supper with Abbott and a Mr. Martinez, friend of J.D. Stewart.

Feb. 25— F
Called at Embassy and chatted with Mr. O'Donohue. Went to RR again but got no further with negotiations. Then went back to RR with Abbott and discovered that arrangements to

Regalia had been arranged. Had supper at the Foshag's.

2 February 26.

Morning called on Dr. Flores, cordially received but our Sonora work created only mild interest. Picture of fossils interested them. Met Dr. Waring now in charge of Stratigraphy and Paleontology at the Petroleum Institute, Linked with Waring who is much interested in Encrinoids. Agreed to report to him what the status of our encrinoid collection is and if we have any new material for description.

Stopped with Alberto after 4 P.M. and had a "melinda" or evening lunch with him.

February 27—

Spent all morning writing letters and laboratory N. Waring & Thurmond. Afternoon walked out N. Chapultepec park.

February 28.—

Got ready to leave for Sonora. Lunch with Foshags. Had supper with Alberts Left Mexico City about 8:15 P.M.

February 29—

Arrived in Guadalajara about 3 hours late. Left Guadalajara at 12:30 P.M. Had pleasant trip all evening.

March 1.

Learned at Magdalena Nueva bridge was burned out North of Magdalena. Left M. at 10 AM and went to Benjamin and Unloaded baggage to train on North of bridge. Stayed all day all afternoon. Unloaded sheds on beach part of

3 afternoon. Locality is 4 km. S. of Poole, about 1/2 mile S of Tolmedo gold field on shore on north side of a small creek. Shelly sandstone + sandy richardsi gravel. Started north at 3:45 P.M. Fine dell locality is 21 km. southeast of Dinuba where we spent the night. The engine ran out of fuel and we stayed at Dinuba all night.

March 2. at 12:30 P.M. we were finally rescued by a freight engine and we started laboriously + N.W. north. Pretty slow going at times.

March 3 - Woke up in Los Blos with a dry and misty feeling about me.

March 4

Visit California Academy and see if Reimondi fossils can be found. Check La Canta fossils with those from the Montoya Lode for King's paper on Blanco Group. Regard in my letters on Sec. Capt. Reached Nogales about 8 A.M. Took room in a small hotel. Want to consulate at 9 A.M. to learn that air photos had all been taken out of the village. Hang around Nogales till 8 P.M. and then Out Train for Santa Ana where we arrived about 11:30 P.M.

March 5 -

Spent day in Santa Ana walking around Blos service to Cabrera had been stopped on this very day.

March 6

Santa Ana - to Cabrera where we arrived at 4 P.M. Spent remainder of day making arrangements for living + field work.

Cerro de
March 7 - Manuel Pino 20 miles

4 Small knoll east of "Lopez" and NNW of Cerro Prieto Imperial of limestone breccia bearing dark blue gray but pebbles of pink stone suggesting the underlying Pliocene rock. The knoll itself consists entirely limestone and is structurally controlled by Cerro Manuel Pino which is 5-6 miles NNW of Catrina.

La Zorra is a low hill on west side of Sonoita road about 9 miles NNW of Elenco. It is composed of basic igneous material. About 3/4 - 1 mile west of La Zorra is another low hill composed of limestone pebbles. The west of the north end of this chain is a small remnant consisting hill of boundstone pebbles.

The hill just south of the Mine is of limestone and probably spring the chief mineral SE. The rock is dark gray, much worn by weathering and has very rough on the surface. Small irregular pockets of white fine crystalline limestone is present. The only fragments that seem at Cerro Manuel Pino this morning and of which it is probably a reef limestone, small masses appear W the SE. The alignment of the hill is ca. 310°. Small calcite veins are abundant.

We went out Sonoita road 9-12 miles, it is not certain just what the distance is. The rocks on the east side of the road are mostly consisting of white limestones what flakes with Quaternary. Basic flows are in evidence on the west side of the road. Continuing to page 6.

March 8 — 20 miles

5 Gasoline 10 litres 3.00

Spent morning in north end of group of hills East of La Zorra and East of Longita road. All hills visited proved to be composed of hornblende porphyry like La Zorra, the claims west of Bel Zorra and the small conical hill at N end of 2nd claim W of La Zorra.

rhyolite?

Large hill 3 or 4 miles northwest of Abra is composed of a central ridge of dolomite and quartzite with narrow horbon on northeast and southwest flanks. The rocks are so altered that search for fossils as here in hopeless. A layer of sandy dolomite seems to dip at 340°. The main portion of the hill is the granitic rock of unknown age.

called Rulz.

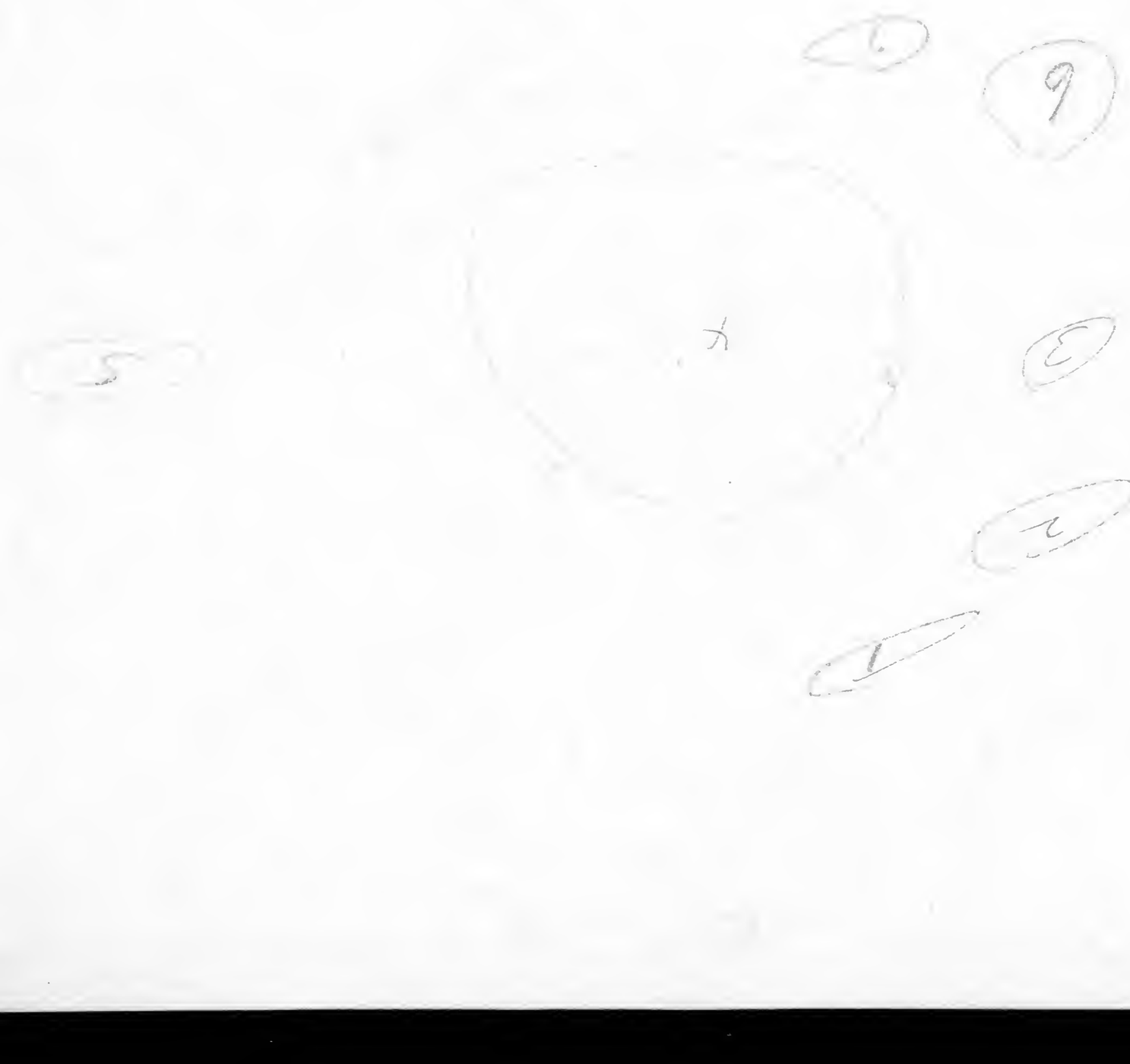
All the hills on the east side of the Longita road north of Cabras seem quite hopeless as possible sources of fossils. They are either composed of igneous materials or are so altered as to have almost destroyed the fossils completely. The unaltered or only slightly altered rocks north of Cabras seem to be north of the Pedregoso mass.

March 9-
Fill regular Transmission
Gasoline 15 litres (to be paid for later) 2.25
6 Dip direction 125° dip 20°, 30° S

30 miles Entrance in real Lapon hills. The hills are rounded but rock and called Lapon hills are called Tundra. Lapon hills consist of one hill with two knobs on the east side which is composed of homblende porphyry (possibly Diabase porphyry) West of this is called Hilles. The main road of the Lapon with a low about chain to the south uniting with the main body on the northeast and enclosing a small amphitheatre. North of the main mass are three isolated knobs.

The Lapon consist of dolomitic limestones alternating light gray and dark gray to black, dipping about 30° to the South. The light gray rock weathers ash gray but has a coloured but darker gray fracture. The light rock is very dense and very fine grained.

The darker rock weathers nearly black but fractures to a steely gray and is usually finely crystalline. The dark often contains veinlets and/or masses of brown weathering calcite. The light rock is often very thinly bedded with the bedding planes to lie on the surface. The dip of the dark rock and the bedding is often wavy, showing pretty a plain and it often appears to gently dip to yield fossils. The main hill is composed of Ekaluen but there are Tarnuella on the alternating colored bands of parts of the Ekaluen.

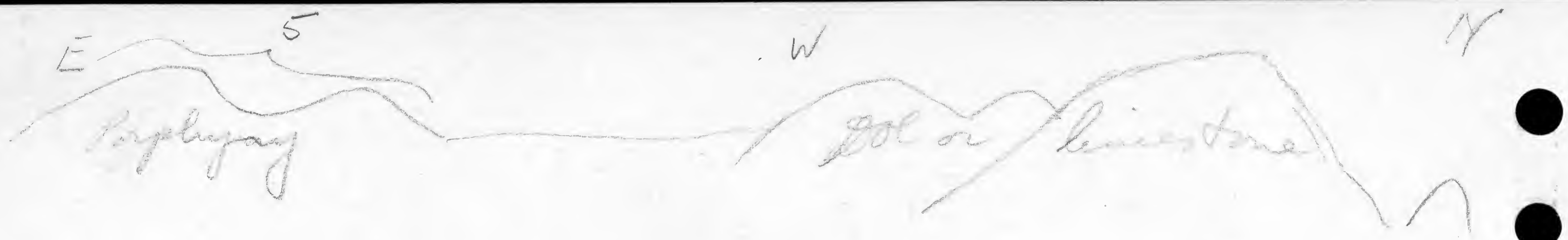

5
4
3
2
1

Hill no 1 of Fox Lagoon consists chiefly of light colored fine-grained rock colored by many darker & and overlain by mottled brown and dark gray limestone. Between the mantle and the underlying dark rock, in a thin bed of light buff clay stone about 5'-6' thick is much of the igneous conglomerate at base. This bed did not seem much altered but a search for fossils in it proved fruitless. The light colored mantle seemed considerably altered and in the dark rock fossil networks of silica are present.

Hill no 2 — is low pointed knot of massive dark brown-weathering brown or reddish brown massive limestone. This rock all weathers dull like a dolomite. It contains many brown siliceous nodules. The south side of the hill is of light gray dolomite.

Hill No 3 — very heavy bedded massive limestone, dark gray and mottled brown and gray with the brownish part standing in irregular relief. The lower half of the hill is of light gray often pink marble. This is overlain by a massive ledge pitted dolomite. The contact is sharp but the rocks are so altered fossils cannot be got. The lower part shows thin wavy bands of bedding with distinct of bedded chert and thicker layers and lenticular masses of granular or pure limestone. The whole is now considerably but the ensemble is typically that of the Carboniferous. Fossils all changed to pink.

Hill 6 is directly south of hill 4 and is of dark gray fine-grained dolomite & limestone with a shelly fossiferous fracture. Contains



top of ridge

thin horizontal white veins of dolomite or calcite.

Also a small round lens of 4 to many cm flaky shale chips down on the valley floor in all parts of this section.

Albertella formed one dolomitized limonellid in Hill no 2. The whole sequence suggests our El Paso.

March 10 -

15 Miles go from Valmora

Lost Depression

Examined group of hills between Las Vegas and Tecolote. At north end is a low knoll of dacite? (hornblende porphyry) but to the south is quite a chain of large and small hills. All examined individually all of them and all near the contact of the weathering cream colored cryptocrystalline dolomite of dark gray to black steel gray dolomite. Fossils do not be seen but traces of sedimentary structure in the form of bedding and rolite, are often present. The presence of oolites is most suggestive of caution and of the middle E Mesa it is of that level where these structures are most abundant. The structure of the area with their E-W strike suggests that these hills are also of the El Paso dolomite limestone. Nothing in the lithology will negate this interpretation.

On the west side of these hills the dolomite is much fractured and the zone of fracture is a zone of brecciation forming a low saddle which from a distance suggests a zone of shale lithology. Almost at this point the trail goes over the edge of a volcanic

The rocks examined Nw morning seem to
strike into the Lopez igneous rocks.

9 On NE side of Calgert hill of this
group about 40 rods below
Linds Bros. we find a
investigation about 180 feet of
platy limestone and yellow and dun
shale runs from top of the
hill just south of the down cliff on
the north side. The upper 30 feet
of this platy limestone forms a dip
the rocks 26-25°E of the slope half
came N. Gen. and about all
seems to be the same formation
as the Asbestos zone just east of
the high ridge on the middle of
Pomeroy. Near the top of the shaly
beds flagstones was taken out of
about fifty feet. Numerous ocean
fossils and the top of the thick
material ocurs a layer 2 feet thick
thick of reddish oolitic limestone
containing small fibrite veinlets.
Am not certain if this material
was in place.

A large collection of pieces taken from
this place.

March 11.
Laundry 4 pcs (one check) Brown Pad
2 gals of gas from W. Shovel

10 Los Angeles dip on the shales 34° dip
185°. Limestone dipped 20° at 185°

Dewitt

Left Base — Low hanging ridge
of the first backbone or part forming
finger of Northeastern most ridge is
composed of vertical conglomerate
interbedded with purplish shales. All
are baked hard and altered with basic
igneous material. The conglomerate
strikes 320° and is about vertical.
From east of this conglomerate
a went 1950 or nearly due north
across the strata of conglomerate, buried
shales, lava. I passed altered Lava Flow
This conglomerate and shale with
occasional beds of thin limestone
continue for about 100 yards horizontally
where the hill steepens and a great mass
of limestone conglomerate appears. This
seems to me to be old consolidated
talus because it lies on the upended
edges of white marble. The marble
appears in the gap at the front and
of the hills facing the W. This rock
is so altered that it is hopeless to look
for fossils in it. I should say that the
conglomerate to the marble should
occupies 75 - 100 yards horizontally.
The conglomerate is mainly gray
dolomitic limestone pebbles, subangular.
The marble outcrops to the
point crest forming the highest part
of the hills on the East side.
West 130° from crest between valley on
east side and next crest on hills to the
highest point.
Dip near N crest on Marble is 45° to the S 165°

about 50 yds of east color of dunite changes to gray (actly) and the rock looks to be a thick dolomite.

11 On the inside or east face of the amphitheater cream colored dolomite (or L) alternates with band dark and gray dolomite, the gray bands weathering out rough, like the bedding in the lower El Paso at Arroyo. The strike is 305° and the dip 70° NE (28°)

In ascending a bed of shale some 20' thick which underlies banded lo. The shale is definitely fossiliferous but aside from a few fish fossil nothing definite in it. Fish shale suggests the shale seen in the El Paso at Arroyo just under the first bed that yielded the gen. Dalmanites. The strike of the shale as measured on it's face is 120° and it dips north (10°) at a dip of 23°. Lithologically all the beds seen in Lota Blanca belong to the El Paso except the conglomerates at the northeast end.

The west end of Lota Blanca is a low hill of dark dunite banded to strike 125° and dipping 28° to the NE (35°)

Post El Paso Conglomerate has broken quartzite with a little red jasper. Pebbles range in size up to one about 1 1/2 times my fist. A green mineral, probably olivine fills crevices and cavities in the conglomerate. Lime pebbles occur but are rare.

According to Alberto the contact of the congl. and ls. may be represented by the lime stone conglomerate which may be a fault breccia. The copper mineralization is in the lime stone breccia.

March 13—
Schiaels at
Gasoline
12 Cerros Bucluna (Bajada of 1945)

5.00
2.30

Collected west hill all morning. Oleadlleo extends for a long distance above the Conglomerate. The specimens are mostly all badly broken & some pieces of fork are accumulations of Tubiclike fragments. Discinella occurs with the Oleadlleo and Salpingella occurs in lenticular beds throughout.

A layer of Scolithus tubes appears low in the quartzite sequence of the west hill.

Above the Conglomerate on the West Bucluna the limestone is thin bedded blue gray containing many fragments of Oleadlleo and a study of Salpingella fibers in the exposure. The limestone becomes heavy bedded in Layers perhaps ½ ft. In the lower part Salpingella is well developed. An horizon of Salpingella occurs well up on the slope and turns the top yellow or brown beds appear which are probably like those of the E. Bucluna which contain Antigymnocerus.

East Bucluna - spent 3 hours on the east slope of the east hill collecting. Antigymnocerus and Oleadlleo rather abundant Salpingella within 40 ft of the massive ledge forming the top. The upturned Salpingella after just above the heavy beds. Not as common on the Oleadlleo ledges. The other

Lava and vent to small alluvial
and are more dipping to the
13 Feels from Main on the hill.
Fine Vesicular Igneous and Sedimentary
Rx Green.

★ Took 5 photographs - 5 of Sculptures
and 2 of the West Boulder, Park #1.

March 14 32 miles Area

From west side granite knob 280°
granite peak, Large crystals, rounded
disintegrated /
280° 0-45 granite
1970 255 paces granite to low saddle
280° slope ∠ 20° 44 paces to crest
280° 87 paces in granite to contact with
sediments. Contact granite altered to white
to phyllitic
280° Slope ∠ 17° Basal quartzite and to show
orientation of grains and a slide check.
51 paces to crest - Strike 3°, dip 40° West 173°
332° 60 paces Through thin bedded brown sand
and tale. ag. At 60 paces a Thick 32'
of dark sandy L.O.A. 152 paces fine bed
Lenses get. Strike Thick, Three feet
Sandstone ∠ 165-295 Slightly Schistose
and fine grained Jim - Nothing 295-310
Co. 295-395 - mostly Talus - Ridge Capped
395-470 Base Ft. - Contact sandy Co.
in Thick to pure and Lenses separated
by Covered ones.
310° 71 paces in blue blocky Fossiliferous
Sandst.

14

325° At 23 paces an elliptical mass possibly algal and it shows concentric banding. Strike 35° at 335°. Strike 50° to 240 Paces over blue flecked bedded to. with thinner bedded brown weathering to at top. This brings a gully coming down a shale slide beginning 75'-100' east of gully

320° Slope 234° Dip 26° at 335° 147 Paces up slope entirely in reddish quartz micaceous shale with beds of to. Above 147 the cliff is nearly vertical and here is measured by hand-level at 60'. From top cliff down slope are 50' more thickness to the valley floor.

On base of cliff strike is 25° and dip 30°-290°

These rocks are separated by a broad valley floor from the next high hills not climbed on this trip.

See p16 The upper most rocks forming the cliff and the dip slope are mostly gray, often buff weathering, heavy-bedded to. with the layers often separated by black streaks with fine crystals elongated ⊥ to the bedding.

Strike on this back face is 3°, dips 58° to 273°

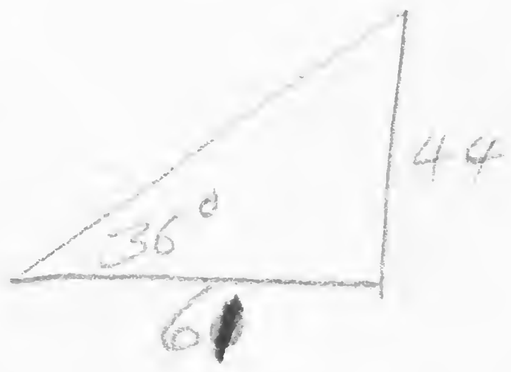
Strike on lower part thick upper ledge is 3° and the dip is to the west at 45°.

Morning of March 14. - examined several hills at N end of mass. ~~Found~~ One isolated hill was mainly of reddish shale containing beds and layers of ss, and capped by limy sandstone at top. This suggests the succession seen in the last hill this afternoon.

The main part of the hill at the north end consists of steeply dipping (west) quartzite (white) and conacht sandy limestone in fault contact on the west side with dark gray to black limestone containing beds of two kinds: fairly large elliptical ones and elongate ones built into a column 2 feet or 1.6 m long. These beds are nearly horizontal and above them lies a thick sequence of nearly horizontal gray sandy limestone beds. I did not climb up over the sequence. I am unable to place any of the beds seen in any part of the sequence known to me.

Cerro de Temosa are small hills at the north end of this claim and in the valley.

13 Silver Lode
Old


44
36°
6

March 15 –
Pomeroy – Miles W of Cabrera

16 About 150 yards S of saddle in a side (east ridge) Ammel Bloomfield under horizon fr Kootenai. The slope ∠ from Kootenai to horizon was 36° and 35 paces to reach it and the vertical distance was 44'. This puts Glyptoma here 60 feet under Kootenai.

Collected east and west sides of saddle at Pomeroy. Just east (west of) high bed in saddle collected a fair number of fossils and this last bed like Nelson (Clendale). Almost all of these labelled as Albuquerque and they must be changed.

On east side of saddle is a low ledge formed of about 1½' of heavy-bedded white limestone & it is at the very top of the shales in the saddle. This ledge contained many fossils, about 20 feet below the Glyptoma contain fossils.

A fossiliferous bed from which nothing was obtained because the material is too friable occurs 50' vertically up the slope with a slope ∠ of 20°. About midway up this slope occurs a thin bed about 1' thick containing numerous fossils and a large collection was taken and was called Th in Bed.

The Kootenai seems to occur at the top of a thick bed of heavy bedded limestone forming a prominent ledge high up on the east side

of the saddle. All of the material from this bed was finished of very fine-grained limestone. This bed still higher in the section.

17 The final collection was taken between the El Jun and the Kayenta fed. of this thin-bedded platy ls. enclosed by the shale. Yield one thru 8 horizons of fossils between the high ledge in the saddle and the El Jun.
Photo to N, and picture of fossils taken.

March 16 Cerros del Agua

9 Litres gas } 4.20
1 Litre Li }
Gas 13 litres 3.90

35 miles

Continuing section of March 14.
Horizontal distance through shale hill approximately 200 paces from probable base of shale to ledge outcrops on west side.

312° 267 paces covered in valley floor.

312° Up slope ∠ 29° 16 paces white to quartzite & Calcareous ss. contact irregular. At 113 paces strike 23°, dip direction 297° and dip 36°. From 16 paces to 150 rock is light gray weathering but from 150 - it is thinly bedded but massive weathering into blocks 1-2' thick at 182 ls. is light gray and oolitic. 206 some pisolites. At 224 a zone of elongated algae. Thin ls rather massive weathering as seen above. The fossil zone at the N end of the hill also mound algae. Tools picture 11.

Top of hill comes at 361 paces above valley floor. From 224 to top of hill algae are abundant on middle portion of the rock. Hyperstrom. at the top of the hill.

40° 1740 paces algae disappear and rock is quite pocked with small cups of dolomite and calcite. At 60 the rock loses its black color that it retained from 224 in previous step. Three 60 paces were done on the horizontal

330° slope ∠ 22°. At very base is a light gray, thick-bedded ls. packed with elongated stromatolitic algae. Ss. occupied 5 paces. 122 structure like Linnaella. Rock to here prevailingly light gray but with some black thinly bedded ls. At 240 strike is 320, dip is 30° to the SW. (230°). At 250 top of hill.

320° Slope ∠ 15°. 130 paces to top of hill all ls. that is ~~[illegible]~~ fine oolite. Also contains considerable intraformational breccia.

310° 107 paces. to bottom of hill

310° Slope ∠ 26° - 118 paces same oolitic ls.

290° Slope ∠ 17° - 150 paces to highest summit. all through same kind of limestone. From the crest the small hills lying just to SE of this mass belong in the lower clastic part of the sequence.

A ridge mountain range lies some 5-8 miles south of here and is composed of sediments according to visible structures. This may be Cerro del [illegible] Coahuil

Structures of this area seem to strike with those of the mountains to the south and they may be essentially the same. The dips in this area to the NNE (20°) from this hill all seem to be the NE or east rather than to the SW or W and we may have here a large anticline. Furthermore the foothills of the mountains to the NNE are of red rock similar to the foothills beds.

19

The algae are convex upwards in the rock.

gray oolitic (?) ls. D

The contrast in the colors of the two areas of rock. A + B and C + D is striking. The former two have considerable red and brown in them despite the blue limestone. All of the rocks show evidence of having been considerably altered but not sufficient to destroy sedimentary structures. The algae for example are most greatly altered.

Black + gray ls with algae C

Quartzite + calc. ss B

The valley between the two hills is occupied by (B) as shown by the southward divide exposes this rock. This is the same interval as exposed at the north end of the hills under the algal ls.

ls + shale A

Granite

Hill just N of dam and between hill on which dam is anchored to the east and the hills terminated at the N end of the claim. Composed wholly of moderately heavy bedded limestone of various kinds. 1 is fine grained greenish gray and weathering to light gray brown. 2 bluish gray weathering grey. 3 Black banded ls with bands of light and dark and very thin. Between layers of reddish brown ls. None of the developed layers of black calcite

20

that has a perpendicular sheen to it. West of Hardin's Store is quite a quarry and the siliceous is generally open to the sun but on a thin quartzite the slopes have been weathered

Hill NW of 1st hill examined in this group, 340° and about 1/2 - 3/4 mile Outcrops of green and red phyllo-with interbedded Precambrian quartzite.

Picture 11 - algae
" 12 - limestones of Cerros

March 17 - Cerro Prieto
Quartzite ~~317°~~
Strike 317°, dip 18° to the SW(210°)
27 steps with Level set at 19° for thickness of 145'
Hard vitreous quartzite, heavy bedded often showing bedding by black lines or bands. Rock iron stained. Dip on back slope is 25°. Coarse grained Coarse granular sugary. This also lies on the N side of the hill.
Cerro Prieto proper
Slope ∠ 23°.

At 183 paces thick capping ledge appears. 300 paces to edge of hill
Slope ∠ 5° 59 paces
" ∠ 1° 91 paces to top of hill

Strike on very top of hill 70°, dip 11° due South. The rock is from 183 to top of hill is very dark gray and abounds in large dark fossils. Of strongly resembles the Jojoba of our last year's trip.

I went up Cerro Prieto through a prominent rift in the front about South-southwest (210°) from the small quartzite hill.

Doubtless many fossils were in this on the lower part of the slope

Continued

2/ and they are all found in the upper part of the west Lapoo-Loma (W. Buena) from the upper Saltvilla zone through Antagonite. I think it highly possible that the Buena hills represent upper Saltvilla down to the quartzite of C. Prieto about 100-150 yards only between the base of the quartzite hill and the base of the big hill.

Close together 1½' The yellow shale with lo lenses Saltvilla was taken in place from the at the very base of the hill (190°) south of the center of the quartzite knob. The beds outcropped between 5 & 10' above the stream between the two hills

Talus bits were taken from in place about 25 yds east of the gap in the main hill and 60 feet vertically below the black capping lo.

Indications point to considerable yellow shale & thin-bedded ls. below the main thick ledge.

115 paces occur between the topmost quartzite and the lowest shale with the lenses of Saltvillella.

Cerrito del Milla

An afternoon lookout over hills just N of town behind the city abattoir. Two low hills of limestone containing some quartzite and considerable secondary quartz. Sandy limestone is also present with occasional grains in a groundmass of thick limestone. Thin sections confirmed that this material is actually C, it may belong to the beds we have taken at C. del Agua.

These hills lie 335° from the small hill just N of the abattoir are formed of igneous rock, gabbro?

Two low hills lie east of the hill just N. of the Ablation. On the west summit
22 rue a dike of fine grained igneous material with 325° Azm. NE center of the hill. The softer igneous material produces a track like that of a road. The dike dies out in the higher hill further east. The dike also produces a great deal of black chert, which is often quite flaky.

The larger hill to the east is composed of dark gray limestone, heavy-bedded and deep in color and containing in places large circular algae. The strike is roughly NW (310°) and the dip is to the south.

The rocks of this hill seem to be reefy masses as they show little bedding. Considerable siliceous material has been developed in them. The east end of this hill is at the town cemetery.

Large hill at Mill has been split with a backbone of quartzite running E-W through the hill. To the North but dacite porphyry on NW slope.

Night of the 17th rain. All week it has been cold and blustery like a September day in May.

The upturned edges of formation formed in places ridges. The chert weathers into fragments on the hill. The slope is so steep and that it is quite possible that the fragments could have come to the ground but as it does on the Pennsylvanian.

2126

2059

$$\frac{\text{Base}}{12} = \frac{36}{x}$$

$$x \cdot \text{Base} = 36$$

$$x =$$

23

March 18—

Visited saddle in Pennsylvanian between the Jurgala and the Guantgite on the east of the saddle photos of rock were taken on the ledge which continued from the Guantgite. Measuring from the highest Guantgite the following section was seen:

1. Between Guantgite and a Subcommissive ledge: slope ∠ 12°, vertical distance 36', passes on strike 56.

1-3 Thin bedded blue gray limestone in layers up to 8'. Olenellid fragments and shelly Saltzella.

4-7 Thinner bedded & more shaly but becoming massive toward the top. Saltzella abundant, Olenellus present.

2. Heavy, prominent ledge consisting of 3 units:

Hard limestone	8'	
Cobbly limestone	5'	23'
Heavy ledge with Girvanella	10'	

3. Platy, thin bedded brown ss. 15'

4- Massive ledge abounding in small Girvanella 8-9'

5- on thin Girvanella bed is 50' horizontal dip 60° or about 45'- of thin bedded ash gray weathering, blue gray limestone with Olenellus and Saltzella, the former commonest in the lower part. The Saltzella is present in fair abundance in the middle and thin is the uppermost limit of Saltzella observed.

6- Massive oolitic and brecciated ls. 12'

D- Zona Tinajas limestone to the base of the Jojoba — Slope ∠ 15°, elevation 17'

24 paces 23. Partly as in the lower part but containing fossiliferous lenses of granular limestone, often yellow weathering in the upper part at the very top (but possibly lower down also) Red Tilodite Antiguum? recurs.

E. Dark blue gray limestone with large round, black chalk spots possibly Girvanella (Jojoba).

This section thus links Cerro Prieto to the Buelna hills and indicates that the Jojoba is the oppinq ledge at these places. A peculiar feature of the Jojoba lying between two thin-bedded formations is the fact that limestone shows evidences in all localities of having been recrystallized. Some pieces show delicate floor structure and, on the southwest side of the Jojoba at Pozo Cabra pond marble is evident.

Pack #2.

✓1-2 — Views of Proveedora quartzite, & Jojoba
✓5-6 — Same but from further west on hill.
✓7 — View looking N from valley showing
interval between quartzite & Jojoba
✓3-4 — Close views of Proveedora - Jojoba interval

all of Cañada
✓8 — Hill SE of town 145° from top of hill
✓9 — toward mill 185°
✓10 — " Cerro Prieto 215°

8-10 taken from point of hill almost due N of mill. (185°) and cathedral 178°.

11 — View of Cañada from N. embankment
12 — Cerro Prieto from the N.

failed to draw slide
✓ Pack #3.
Cerro Prieto from the west 2 views 1-2.

Two small quartzite hills occur due west of the small hogback on the N and two hills occur on the east also in Proveedora quartzite

The upper fossil ledge is 120 paces east of the gash in the hill and 60' below the cliff

At this point in our work we think that Cerro Prieto and Cañada mark with the E hills on west side longitudinal, the east side of the Cantera structure and that they overlie all the rocks on the west side of the

875
625
1918
580
476
120
617
455
275
635
202
270
325
139
488
304
558
189
507
305
677
988
43
570
400
506

18561

6000
.07
420.00

Lamagta road, the northern north of town and Hugo on the east edge of town. all the latter may well be Pre-C age, capped by the quartzite bedded with limestone and the presence of algae in the hill at the cemetery on the NE edge of town.

March 20—

1 litre oil— 2.00
Stamps 3.80

32 miles

Gachupin

Section up west front of Gachupin starts at W point of hill almost due N (15°) of highest peak of Cerro where I made a section on March 16.

17° 508' Along base of hill in reddish-stained quartzite. Dip about 55° to the NE (15°) 203 paces.

17° 400' 160 paces to top of quartzite. Contact irregular.

98° 570' 224 paces to quartzite contact.

356° 43' Slope < 25°; elevation 20'—quartzite only top.

Slope 25° dark gray to black Ls. all way 460'
988' Strike 265°, dip 30° N. The beds contains algae for whole distance algal bed about 600' thick. Total elevation is 460'

72° 677' Along crest to peak, Slope L 21°. Dip is about all along the strike. Elevation at crest is 740'. And this is essentially the top of the algae beds. 740 - 460 = 260' elevation

345° 307' Slope L down to saddle 18°; elevation 640—a drop of 100'
Dip is 23° to the NW (325°)

27

345° Slope ∠ 22° 20' above saddle
comes top of algae formation here with
mottled black & white lo.
507' Elevation to top of mountain 845' above
Dip 17° to NW (325°) plain at quartzite contact.
Diff in elevation of saddle & top is 205'.
From Algal ls up the rock is light blue
gray weathering, contains thin
bands, peculiar white horizontal
bands of a mineral with X'ls ⊥ to
bedding
Strike 45°, dip 25° to NW (315°)

303° 189' Slope ∠ (down) 9°, 100 paces, drop of 30'.

325° 538' Slope ∠ 16° down; 160 feet drop in elevation

28° 304' 152 paces, Slope ∠ 8°
dip 25° to NW (325°)
Rock here mostly light blue gray
smooth fracture

327° 488' Slope ∠ down 11°; feet descended 95.

325° 139' Slope ∠ 16°; elevation 40'
Is light blue gray with sand grains

327° 325' Slope ∠ 7°; elevation 40'?
Gray & with the edgewise markings

326° 270' 108 paces 270'

327 202' Slope ∠ down 24°; elevation 90' down
Limestone fine sandy.

355° 635' 254 paces. Much edgewise type lo.
Rock mostly as on sandy limestone

28 A considerable increase in sand is noticable at this point and alternates with the paler limestone

357° [275'] 110 paces. Strike 35°, dip 24° to NW (303°)

323° [455'] 182 paces. Rock here somewhat more thinly bedded, splitting into pieces 2-6" thick. Often brownish as well as grey in color. Also yellowish. Little quartzite at this point.

303° [617'] Slope ∠24°, elevation 275'
On lower half of hill mostly moderately heavy bedded blue gray limestone with some sand. Upper half brown weathering massible, poorly bedded & with much sand and quartzite + quartz conglomerate.

317° [120'] slope ∠14° Elevation 30'
Lower 25 paces are in platy gray sandy shale, top of hill is capped by purplish weathering massive limestone containing some sand.

43° [476'] Slope ∠6°; elevation 50'
This is the highest point on the W ridge.

30° [560'] Slope ∠15° down Elevation 150' down

335° [918'] Slope ∠16° down, elevation 550' down.
At 120' down the sandy shale was again encountered above it is the purple weathering ls. Big loose quartzite can be seen on east side of hill.

327° [625'] Begins in calcareous sd quartzite 88 paces heavy bedded calc, ss 23 paces red weathering shale, may be same as on top of hill

29

139 paces in massive limestone
light gray weathering. May be same
as people heathen ridge top of hill

330°

875'

330 paces - last 50 in thin bedded
quartzite but 300 in white marble
structure uncertain.
The foothill just SW of the marble
is cut off from the white mass
by a fault in the draw.

Zinc
1356'

Pack # No. 3 - One view showing dip
Samples of thin material sealed
with acid show nearly all parts
of these sections to be composed
of dolomite.

March 21 -
5 gallons (ca. 24 liters) put in can from tank
Section on east side Madison
Section started from top of small
and most outlying knob 262°
from north end of cultivated field.
This knob like all the rest of the
fan-like area in front of the east
bluff is composed of a yellow gray
rhyolite or dacite of igneous material
And fan is 205° E. of Pt Studley

March 20

273°

3921

Slope ∠ 15° Elevation 105'
Top of this integral comes in
place with rhyolite up the slope all
the way.

270°

1241

Slope ∠ 31° Elevation 75'
Top of quartzite occurs 75' vertically
above the first appearance of it in
the slope

~~270°~~ ~~Slope ∠ 0° Elevation above top of quartzite~~
~~to top of hill~~

.7071
650
35355 0
42426
459.61 50 = 460

Quartzite has grain of coarse sugar and no cement at all anywhere. The dip is roughly 45° W (270°)?

30

270°

649'

Slope ∠ 31° Elevation from top of quartzite to summit of hill 390'

Strike about N, dip 40° West.

" dip 50° " (280°)

Elongate algae prominent at 220' above quartzite

Strike N, dip 43° to W (271°) End on face. The summit here is not the highest point on the crest and it is not quite the top of the algal formation.

algal bed. 160' thick

206°

165 paces

413'

At 115 paces a layer of black rock is porcelain by light gray stone. This is probably upper chert of algal bed. At 165 paces is a ~~low~~ low saddle containing thin bedded shale for about 8 paces down dip.

On saddle there is a conspicuous bearing of the dip, probably a fault occurs here.

Strike 7°, dip 23° W (279°)

The saddle is just west of the highest point on the ridge and also the most southern point.

The dip on the black bed at 115 paces

~~220°~~

is 50° to the west and at once is to with the white porcelain. A reasonable change in the dip and the large change in strike paces a fault is probable. The strike however does not change. It could also be unconformity or recumbent structure

280°

300 paces

At 83 paces rock has the peculiar

750'

edgewise structure

at 100 paces strike is 10° but dip has steepened to 35° W (280°)

All this distance is in the edgewise type.

31

235°
[700']

280 paces mostly in edgewise material with a little dark bor dol.

285°
[433']

Slope ∠ 13°, Elevation 100' down dip 18° to W (300°)

313°
[70']

28 paces Light blue gray dol.
Strike 120 dip 30° to W. (282°)

275°
[178']

71 paces.

258°
[325']

130 paces.
Strike 17°, dip 23° W (287°)

283°
[150']

60 paces

292°
[1411']

Slope ∠ 12° (down) Elevation 900'
This brings me to the confluence of two small canyons

258°
[517']

Slope ∠ 12° up. Elevation 110'
Light gray dol. dipping west 17°

245°
[205']

82 paces. Light gray dolomite, a thin layer of quartzite and top 10' mostly in dark blue gray weathering dolomite.

230°
[712']

Slope ∠ 8°. Elevation 100'

293°
[43']

17 paces.

335°
[459']

Slope ∠ 8° Elevation 205'
Dip 20° W (303°)
All the way in very light gray weathering, often rounded ledges of dolomite ending in a massive layer on the peak at the N corner

280° Slope ∠ 11° Elevation down 65'
334' 32

200° Slope ∠ 7° Elevation down 110'
[895']

252° Slope ∠ 15°; Elevation 45'
[168'] Heavy bedded blue gray sandy dol.

232° Slope ∠ 9° Elevation 50'
[315'] Sandy massive bedded dol.

227° 50 paces.
[125'] Sandy Loamy bedded dol.

295° Slope ∠ 13° Elevation down 560'
[2425'] 110' fault down from place of sight dolomite gives way on same dip slope to a Thick 10-15' ledge of quartzite white vitreous. Dip on quartzite is 21° to W (292°)

The quartzite thickens enormously down the hill but at 450' below sight it has dolomite over it which thickens to about 50'. Fine sections ends in the plain only a few distances east of the low marble hill where I ended my section yesterday. The quartzite from Thicken to 75' and fine platey seems to fine on into the dolomite.

Elev is about 50' lower into the plain or about 610' from last sight.

March 22

23 Bar (11 like) & oil SE end Gadsupin 5.30

350°-355° algae appear abundantly at 280' above quartzite. Slope ∠ can be got from notes of March 20. Elevation 460' above quartzite

71° Slope ∠ 21°. Elevation 240'

This interval is along the strike on the crest to a high knob. The elevation here checks perfectly with that of March 20. and the descent to the saddle where the top of the algal beds occurs is just

348° The knob at 240' is practically the top of the algal bed.

Slope ∠ to top of algal bed is 11°

Descent 90' to top of algae, 109 to base saddle

Pack #3 pictures 4 & 5 from summit to base top of algae are exposed looking at beds above algae, with Proterozoic showing just on left side picture.

Direction

Top of hill east side dam 178°

Top end isolated hill at Sandia Base 244°

High granite peak of Proterozoic 315°

Silky fibrous material looks like vein which has been deformed.

Dip 21° NW (314°) taken on algae in the interval direction 71°.

2 miles

Pack #3 pictures 5 & 6, 28, algae & portal gap SW front of Mtn.

7 - algae

8

9 The algae seem in general, that is the well formed ones to be elongate conical in shape & often somewhat pointed. Thin and sinuous in cross-

sections. The largest one seen was
about ¾ long and another had a
34 cross section of 16". The are concentric-
ally banded with the bands convex
upward. A narrow inner core is
of somewhat more coarsely banded.
Specimens are very abundant and
closely spaced in the upper 200' of
the formation, some are very slender
being only an inch or two wide and
over a foot long. The elongate type
is often thinned at the base, expand-
ing apically. The very angular ones may be
compressed. One end some
seems to have small
one bulbing form a
larger one

30°-210°

March 23-

35 — 11 bites gas, 1 bits grave (backend) 5:30

Section in hills W of Ramos
Section starts in red outcrop?

201° Strike line

Slope ∠ 24°, Elevation 150'
The rock so is probably granite because
ls. is faulted at 10' ∠ 15' elevation. Limestone
very dark gray, dolomite. At 25' comes
quartzite in 1' lens, very coarse grained,
lenses for 5' thick. At 45' a small patch
of thin bedded shaly ms.
Strike on ls. bed at 50' 310°, dip 60° SW.
at 150' comes gray dolomite, light gray
with white dbl stringers.

133° Slope ∠ 22°. Elevation 50'
Gray dolomite

179° Slope ∠ 24° Elevation 80'
Gray dolomite

210° Slope ∠ 12° Elevation 50'
Rock much altered & fractured here.

238° Slope ∠ 28° Elevation 50'
Steep descent to a gap in hills
rock fractured gray dolomite

238° 44 paces in thin-bedded quartzite
alternating with dark gray dolomite
and sandy dolomite.

220° Slope ∠ 21° Elevation 90'
Gray dolomite, dips mountain but
rocks to some flattened considerably.

202° Slope ∠ 16° Elevation 75'
10' up in this interval dolomite gives
way to quartzite which extends to
the top of the hill

221° Slope L 20° Elevation 100'
28 paces from last quartzite is overlaid
36 by dolomite. Quartzite sheared & ground into
small pieces About 1/3 way from top is
a lense of quartzite another occurs at the
~~216~~ ~~Slope L 16°~~ top of the step. The dolomite
above the quartzite lens contains some
bedded sand in it.

216° Slope L 16°. Elevation 100'
1/3 way up slope dolomite no. strikes
300°, and dips 40° to the N(30°). This seems
to be a reversal of dips.

~~Slope~~
2240 Slope L 15°, elevation 90'
dip 40° to NE(40°), strike ca 310°
Arenaceous dolomite with interbedded
quartzite.

240° Slope L 25° Elevation 20'

230° Slope L 31°. Elevation 110'
Dolomite gray with edgewise
structures.

The sandy dolomite and dolomite do often occur on top of quartzite lens. The two types of rock seem to be gradational The sandy dolomite also contains pebbles of dolomite which are flat and sometimes edgewise in the rock.
Dip on front is 50° to NE(40°)
The beds on the east front of the hills are tipped up to verticality for about two thirds of a mile. Here dolomites too are interbedded but dolomite makes up the main mass.
The entire section seems to me to be in the upper part of the beds above the oolite, the N W side of the Cacheapin

37

On approaching the hills several specimens of algae were seen in the stream bed which must have come from outside the hills, or possibly from the west side. At last no sign of E or any likelihood of seeing it had.

At last, through a fault stream at the point where the plant bed became abruptly vertical while the dolomite to the west dips at a moderate ∠.

Here at the base of the hill proved very interesting. For this a genuine reef and not an igneous rock, as at first suspected. It contains numerous pebbles, some of them limestone, some granitic. The latter are often crushed and look as though they had been gently squeezed. The little bedding planes between and that take pebbles contain fine dark algal material.

March 24
Left Cat Riding
Lost

38

March 24 —
10 litres gas, repair hood
repair generator —
Shoes for mozo. 20.00
Armature 40.00 3.45

Defunta should be spelled Difunta

On arriving all morning. Generator went bad and had to have a new armature put in, as well as other repairs.

On afternoon went up with Clyde & Ingram and Dodds. Ingram's Packed Black, was to get the mahogany material that was cut about at the saddle.

Found two zones of fossils. One containing Anchitherium about at the base of the Difunta. The other another between the former and 100' above the Difunta. The first zone appears the Magdalena of the Difunta at Angostura but few Artiodactyls occur at Pinacate.

Pack #3 10-11 Panorama from saddle in Pinacate

39

March 25-

No end of hard luck with car, yesterday blew valve stem off tube when a flat developed. Too much of the rod-iron getting this fixed.

Vulcanize tire	3.00
Orange	1.50
Repair tire (2 holes)	8.50

Left camp way about 10:30 and went out to collect west side of Arrowhead. The collecting was disappointing as the fed. returned the different kinds of fossils were not abundant to make the collecting worth while for a short time as I want to get back to camp.

Collected for about last year. Worked for first at the Obelisk beds and tried to find limestone on the east side of the saddle. Here Obelisks become common and these beds to the sands from which the most Obelisks may be called the Obelisk Zone. Two species of Obelisks occur here.

Considerable Spirorbis - like material was seen in the limestone beds. In the Obelisk beds round shells that suggest Salterella and also some elongate large conical shells. although some study layers and thin-bedded sandstone present none of the material of the thin beds of Arpa or Lingulepis. Furthermore the Lingulepis like plant life in the Lingulepis beds occurs here at Arrowhead.

March 26 —

40 Visited Cerro Prieto 2 miles due E. from edge of mountain to Light on metal pin in hill and climbed from to top of hill.

210° Slope ∠ 17° Elevation to lip of hill at 260' 250' horizontal
Elevation to tilolite ledge slope 95'
" to base of cliff 155'

335° Slope ∠ 10° Elevation 20' (125')

198° 100 paces to very summit of hill which is exactly 300' (250')

✓ Pack # 3, picture 12 — Shows from top of Cerro Prieto

✓ " #4 - picture 1, Emirandella on NE side of Cerro Prieto top.

✓ Pack # 4 picture 2, Cañada from road about 1/4 mile N of Medical

Strike on dijota on slope of Cerro Prieto: Strike 106°, dip 14° S (198°).

dijota black to dark gray weathering blue gray in fractured. Some mottled brown gray and dark gray. Emirandella common throughout, usually large and black in color, but sometimes weathers to a gray color. Emirandellas are often tabular like the dijota but more massive.

4/1 March 27-
Can hastily patched up after accident and we reached west end of Proveedora about 10:45. Took several pictures of reef.
Pack #4 - pictures 3 - Olivellus beds on W. side Proveedora.
- pictures 4-7 - reef. one flank

Well 310°-130° SE of Cochayagua Grande and N35° of tank at West Proveedora. Lenses of black sandy material containing pebbles of the same formation as the Olivella beds. The sequence changes to thin-bedded, dark to gray pebbly shale, semi-platy, rifle-mottled, buff-weathering beds and a few thin beds of limestone. This entire make of formation but added to the Olivella beds to make one formation.

between two shelves + above the shelf with reef

1300 meters Cochayagua Grande
N46°W

380 meters N of the hill made up of fractured Eo. (3/4 mile NW of the head), adjacent to arroyo
another Eo. arroyo up in all no part like first only about
Dips 36° to SE (100°). About
meters thick, 20 m. diameter

March 28 Car repairs 2 p.m.
Advanced 1 mi. Vol. 10 p.m.

42 Section in Cons Sed Cl
Above the NE (40°) from Bonanza
almost due E (85°) of high peak at N
end of Cabin. Bed Chert just West
just W of point where section starts.
Slope ∠ 23 Elevation to Top 310
Elevation at top of peak 130'
First ledge with chert 25'
Dip 30° to NE (25°)
First knob or ledge at 210' El.

310

Slope ∠ 16° 390' Elevation to second knob

Pack #4 packs of 8 [illegible] N from
between Yule and Cabin Creek [illegible]
of section begins [illegible] of quartzite
feet SE of Pat gulch

Slope ∠ 16° Elevation (down) 375'
205' below top of knob at 390'
on slope black to brown algae
algae very abundant on slope & base
pickle 9 - algae

From bottom of hill for 87 paces
to base of eight rocks the entire slope
algae strong. The whole distance to the
base of the hill.

Slope ∠ 27° Elevation 1601
at 60' up the slope algae present
but slight. Very wet pebbles in
the draw

Picture 10 - close view of bed above algae. The valley running behind the hills runs down the algal bed.

113

The point at 80' where lithological change was noted is about 40 yds of the algal bed. The algal bed is much thicker here than in the hills to the west. The algae here are more of the conical type with circular cross-section.

335° 34 paces.

24° Slope ∠ 22° 150' down to stream
dip here 40° to NE (60°)

53° Slope ∠ 28° Elevation 240'
Point A Same light to medium dark weathering dolomite. East of my position here which is NE (45°) a few thousand feet of rock, chiefly dolomite + no. Texas are in evidence. / See p. 44

66° Slope ∠ 29° Elevation down 275' ±

See page 45 for continuation of section.

From point A a good view of the
backslope + Anga hills can be seen.
44 The high crest of the foreground is flanked
on the left by lower hills which dip
as though the south side has been
faulted down. Here would help
explain major dip and strike
anomalies. From the Anga hills a
long chain of low ridges extend
to the south. These are probably on
the beds below the algae. The dunes
are granule ripples of Anga. The
light peaks of the Anga and the faint
low in the beds above the algae I
because no one. Lenses noted near
there. The long chain of low hills
through which the road SE from
Pitiquito Lands is in the upper part of
the beds above the algae, the part in
which quartzite lenses are so well
developed. Lat lenses are very frequent
in the upper dolomites in the Cerro del
Chino.

Picture 11 View from Point A, SE (120°)
12 Algae showing subsurface conv.

Algae are shaped from low mounds
rarely more than 3 ft. high to
extended ridges 20' in diameter
Cycles of algae often subject to
form long ridges in rock.

March 29

Tire repair 1.75

45° Oil 2.00

10 litres gas 3.00

Elevation from P.I. to K base hill on S side. 275'

Shooting section from point A

1) 85° 676 paces.

Beginning on peak forming front to 35° (and slope angle is 10°), elevation from flat under point A is 775'.

2) 40° Slope 20° Elevation 95'

Dolomite (marble) dip 11° NW (350°)

3) 140° 270 paces.

Slope 10° Elevation 415'

At 307 paces gray dolomite gives way to a thick fault zone.

At 460 paces andesite dips 15° to NE (65°). At 578 paces chalk long strip in dolomite between 440° & 578'. Elevation 7 feet at north end, 4 feet at south end.

Dolomite on strip 4 paces of broken appearance. Type. Random bedding. Alternation of N has all dolomite on one side, all to on the other. Suspect to be termed a fault. Dip 10° NW (335°) near top of hill.

5) 350° Slope 10° Elevation 185'

Dip 25° NW (325°)

6) 15° To high knoll peak. Slope 6° Elevation 175'. 2 hills. 775'

46	From sight 5-6 quartzite again becomes prominent and the beds dip about vertical and strike 315°
7) 300°	Slope L down 14 Elevation down 155'
8) 25°	Slope L down 24° Elevation down 565' Strike of fourth dip 310° 565' from top to end of section.

Green ~~[illegible]~~ outcrop about ½ mile NE of the base of the hill. It dips 700 to the NE (42°) and strikes the same as the beds in the hill 315°. Hard layers of ~~[illegible]~~ shales, some altered to ~~[illegible]~~ and sharp pieces of cryptocrystalline quartz in small pebble size. Also seen are ~~[illegible]~~ in the weathered debris of the hill. Dikes appear to be ½ miles to the east from the base of the hill. Dikes appear to be ~~[illegible]~~ to the SE. These rocks suggest the conglomerate and shale, sandstones exposed on the east side of Lake Chapala.

✓ Pack 5 - pictures 1, 2, Quartzite in Place east of Patzquaro
✓ " 3 - Top of E. del Chivo
✓ " 4 - vertical quartzite east from top of Hill Chivo

Faulting is also suggested by discovery of algae float upstream from the junction of the algal test.

The are valleys on the east side extend from the hills to beyond the road along the Northeast a distance of more than a mile.

$ac = 632x$

361
2.5
1805
722
9025
1
631.75 = 632'

.2 924
632
5548
8772
17544
184.7968

9503
632
19126
28689
57378
604.3816

Slope ∠ 17°
361 paces

Sin A = $\frac{c}{6}$

Cos A = $\frac{c}{632}$

604'

632
17°

$31.5730 = 316'$

$\frac{90.5}{5.706}$

Slope ∠ 29°

March 30
1 litre of
Van Dirt

2.00
12.00

47

Loc. Coal Hill to Cabenela

8483¼ coal hill
845 Cabenela
852 Cabenela Creek
857 Coal Hill
Cabenela

54
43
57
43
.4

collected at Coal Hill (Miocene)
all day.

✓ Pack #5, pictures 5 - Coal Hill
from camp.

March 31 — Difunta revisited

Pack #5 ✓ Picture 6, Taken from Coal Hill of Cabenela
7, 8, Panorama including Difunta, Cabenela
Peak and Coal Hill to right.

Eastern hillcrests of Fm. faulted
yellow to pinkish weathering fine tuff
with dense massive reefy limestone
containing small fossil shells
particularly at north end of hills.
Rocks consist. abt. equal parts of fine
tuff matrix to coarse. Most coarse
limestones contain rare fragments
of volcanic rocks and Qtz. Grains. Both
types formed coral but the reefal
like rock is in place right under
the heavy bedded overlying Jopeta
beds.

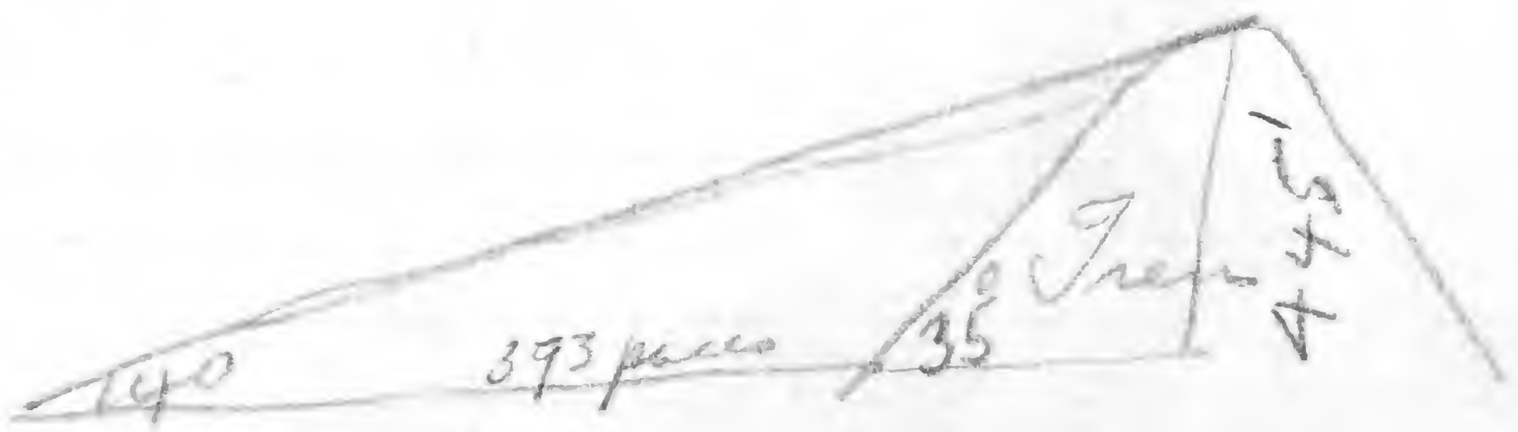
On the east flank of the hill and
for some distance up the slope
occur outcrops of fossil coral
material as. Effect conglomeratic

with crushed quartzite pebbles up to
size of one hand. Pebbles well
48 rounded. This seems to be same
material as at Tinaja Blanca and
southeast of Antiguita. This material
is spread at the base of the in
gulches leading into the creek at
the north base. So far we have
seen this material only on the east
flanks of the hills.

196° Slope ∠ 17° 250' Elevation
Section began at stream
where a small patch of yellow ∈
occurs. Between 143' & 150' all yellow
∈ float disappears and the lower
part of the Jojoba with small black
Simmondsia appears. The slope up to
148' is covered by Jojoba & ∈ float
and for a considerable distance
by ∈ pebble float. This elevation
obtained by hand level.

196° Slope ∠ 26° 250' Elevation down.
Dip 29° to SW (192°)
Jojoba vanishes. Dip slope in
the banded type of rock

184° Slope ∠ 14°. Elevation to be determined.
This is a right on south high
peak of Iron.
393 paces across valley



4 Abo-Yolla beds come about 30-35° down valley flank. They dip 34° to the SW (192°). They attend 1/5 vertically. The Yeso beds are about 60' still higher or at 110' above stream in plain. This fault is located at 160°-196°, southward (180°) from the very north tip of the Yeso hill. The slope ∠ of this fault is 16°. The vertical to Yeso plain is 110'.

Strike on fault is 330° and the dip is about vertical. The Yeso strata unconformable to the E. Fault dips in Yeso is coarse grained, cloudy, irregularly jointed so that it breaks into small pieces. Cutting under masses about the strike & dip.

4 Pack 5-9, sandstone in gully on NE side of Yeso block of 7 different 10-digits with conglomerate at same locality.

Diffendo 14 miles NW of Cabezon

April 1

Park #5 - picture 11 - Lista Blanca

" 5 " 12 " "

NE and showing conglomerate hill

collected at arroyo abt along. elev

morning collected upon mud at

shale below Jacumba Rhyolite conc.

flow collected in limestone at

the very base of the Carrizo shale.

This is the first black shale in

the sequence and is a Foot in

heavy bedded Lo. This Lo. Contains

Spondylus giveni, Pinnatella and

Ostrea. The latter is definitely

under the perplexion near Fish Lk

that ranges higher in the Eocene.

Afternoon collected along Fish

Lake in upper part of sequence.

The Kreyenhagen is shale of dark

brown a Glycymeris zone but

at Precedo it is apparently

above Glycymeris, Lo fossil

brown, and above abt 40 feet.

Found no traces of the other

Precedo fossil Zones.

Under the High Potrero Hill

Quarry the Arroyo Hondo is exposed

Black Shales with Glycymeris

abt 5 feet and the Quartzite as

at Buena and above it Thin

bedded limestones containing

Fish Fragments and Foraminifera

in abundance. We have the

"Potrero" Thus divided in 5 parts:

Upper, Siliceous Zone, Middle, and

Diatomite, and Precedo.

April 2

57 Walked out to hill on continuation of Avenue C. N. just east of where street and Grant ran out interest the hill is crowded with algae, most of the formation with circular areas of deposits

Blank ✓ Packet 6, pictures 1-3 — algae in rock
" 4 — hill, close view
5-6 — hill, panorama,

April 3.

Collected knob just S of biggest hill of Mesa Verde. Fossils not abundant, fossil wood & dicotyledon leaf #6, pictures 7, 8, 9 — Panorama Sierra de Alamo from east.

Gasoline repairs ——— 7.75
Telegram to RR ——— 1.50
Chisels, twine ——— 5.70
Groceries for Automobile ——— 7.95

April 4 —

Spent morning on low hills N 7 W of El Centro. The formation proved to be Pliocene, the Colby Division. The Pliocene seems to be explained to the east to the NE of El Centro.

Often was found fossiliferous beds on the tops of the Mesa Verde with Large Dicotyledonous or Sequoia wood bearing lignite beds. Many dog ears with Dicotyledons in the beds on sides of Mesa Verde near Arroyo. These beds contained Pelecypods & Plants are definitely Pliocene. The fossils must fit the section small fine productus zone & just Conglomerate bed = Dicotyledon leaf?

52 Horseshoeing at El Cuf — Mesa
Doña Dolores Quijada [redacted] vda.
Moreno.

✓ Pack #6 = [illegible]
Spring Mtn — Wheeler Peak
Car repairs (1 pkg) 1.00

April 5—
Top coat of Nevada [illegible] — N.
Top of bed above [illegible] coat of Tank.
N 10° W and strike; strike 344°, dip 57° to
SW 255°.
Contact contacted 65 paces 134° from
NE top of hill. Here [illegible] zone
was picked.

215° 0 - 3 Ft. Aspen reddish in color shaly
3 - 7 Ft. Yellow weathering limy
shale to.
7 - 11 Ft. Aspen; blue, limy to [illegible] shaly
in small fragments. This is a
dense almost 100% limb.
11 - 13 Ft. Aspen yellow-gray weathering ls.
Strike 324°, dip 37° to SW (227°)

158° At 40 paces formed [illegible] base
in a saddle 286° from Tank. At 46
paces comes on outcrop of limy product
zone. Should have crossed a fault
here although there is no change in
strike. This is a higher limb of
limy product. At 71 paces is the [illegible]
at about 195°. At 150 paces another
dike 10 paces wide. On S edge of this
dike comes the large [illegible] zone
[illegible] with defined [illegible]. Ample
present [illegible] may be noted from here

Outcrops at 116 paces. The strike here is about due N, dip nearly vertical. The limy product. Coming out is float on side of hill, as structure is not seen.

53

146 paces, Fine product. Bt 168 paces strike about 340 and dip to SW.

196°

84 paces to saddle between east hill & Mill Hill. Heavy bedded yellow gray weathering LS.

230°

100 paces in shale at creek. Strike 330°, dip about 35° SW.

Not more here
Strike just east of Chisholm crop is 330 and still dips SW

Afternoon - Collected slope on North of Mill Hill. Much material appears to float. That comes from the higher beds. Some plants were found about halfway up slope and suspect that most of it is in the Pushline but does not belong there.

The zone with Lonsdalia Spinifera apparently occurs above the Cancrinella shell below Composite

The fusulinas are estimated to occur 50-60 feet below the zone with the longer Dictyoclostus

Sunday Albert 1.30

April 6—
Collected composite bed in Mill Hill all day. Collecting excellent.

524 Pack #7 pictures 1-3 blanks

April 7 - Collected Sp. "pulcra" from the upper Permian on Largest hills of Mill and NE of Antimonio Mts. Mill consists of two parts, a SE & NW knot. Both due good but about half way up the SW slope of the NW hill. Not far above the abandoned mine dugouts it is excellent for study. The upper Permian is often characterized by dolomite "pipes" of calcium carbonate at right angles to the bedding. The fossiliferous zone is with Spiriferoid

April 8

Added about 8 gallons gasoline

Below Limpia section 2 miles long section 1 paced 195 paces dip 5° through mudstone fine-grained sandy shale, reddish brown, with occasional yellow limestone lenses.

Strike 10°, dip 32° to SW (285°).

425 Views of the Davis Mts. from Mill Hill

Pack #7

165
71
40
5 93
32
50
55
44
45
46
322
865
2½
433
1730
2163'

643
2½
302
1286
1508
59
1256
8040
9156

55 Section from Northern end of ridge
to end in middle of basin to base
of fine-grained massive lower section

A 210° 165 paces mostly open rocks of
Lyons, some shale dipping east?

B 225° 71 paces Lyons portion

C 235° 40 paces
La. lens dipping 37° to SW (230°) at
18 paces

D 208° 93 paces, pebbles shale, to Lyons
Sandstone.

E 228° 82 paces
At 15 paces to lens with pebbles
agate, track, fragments, ammonites

F 201° 30 paces indurated purple gray
sandy shale.

G 222° 55 paces
Dip 23° to SW (225°) to lens of shale
more reliable than lens.
Dip on shale at 42 pace. 39° to SW (225°)

H 225° 44 paces same La lens of fine
dark olive green

I 242° 45 paces same

J 209° 48 paces
At 21 paces same as above
with black concretions

[redacted]

products which include many small
prospects

56

K 209° 222 paces to base of hill proper

On hill of base of sandstone mill
Hill or just North of it. Stretched many
long abutions, fingers of the ocean
made the base. Top of hill is 65' above
Liverpool, + slope L to 21°.
Dip at top is 50° to S W (280°). A few
feet from limestone bed.

263° Approx to base east slope Mill
hill. = 88' vertical

=90° Slope L 30° Elevation 70'
Went up slope for 70' vertical. Found
no Fossils — no Dictyoclostus tech.
at 70' found heavy bedded sandy Ls
with basalian - Unspecified. Here
beginning of the "Carninella" horizon
Then went up some 40' where
reddish indurated shale appeared.
The first Composita left appeared
on the N side of this hill 20' below
the top, occupied 10'-15' of slope + is
Thus 30-35' vertically above Liverpool.
Would put Composita 70' above Liverpool.

Paid Dorning 0 for keep at Ant = 10.00
~~Reimbursable~~

April 9 – Alberto went up examine high mtn. SE of El Antimonio.

57 Light from base of long section which Lino produces appears on west side of saddle ½ to top of long section is 230°, the slope ∠ 12° elevation

X

Lino produces furnace with Dad's was found on next hill south of the one where long section was taken here. The dip is 240° to the SW (240°) Height on the high peaks is 270° and the slope ∠ 15°. This formality is about ¼ mile 170° from Mill Hill East end).

From N top of hill E of Moreno House to W. knot of Mill Hill is 215°; slope ∠ 12° Elevation of the knot –

From Franklin Rd to W knot Mill Hill is 195°, Slope ∠ 15°.

Beds on slope S of Moreno house dip 49° to the SW (235°). = 521 feet –

Hire burros	2.00
Elevation at roof Moreno house	167m AT
" of W. knot Mill Hill	26
Senor Manuel Lopez.	
Contribution to charity	2.50
Advance Domingo	5.00
Domingo's keep 2 days	2.50
Shoes (repair)	2.00

58

Tried to find Fauna but failed at
the Morro Tinaja. The Fossiliferous
in a great "reefy" mass abounding in
brachiopods, Bryozoans and a few other
fossils. This massive end runs from
west to east across Yank where
brachs are first developed & beyond
rear of house and down draw. Just for
limit of exposures on west side of house
the brachiopods include Terebratella,
Lamellirostra and large Composita.
Also found Archaeocyathus here. This fossil
zone can be traced into the arroyo on the
east side of the house where fossils
are far less common. The Cephalopods and
other fossils of this zone occur on the
east side of the hill east of
the Moreno House. This zone is made
of one stratum thickness but includes
a number of layers at different
levels. Its position in the hill east of
the Moreno House clearly puts it
under the Dictyoclostus zone. I
believe therefore the true position
of the fossiliferous is below, one more
precisely in a locally much thickened
portion of the Dictyoclostus zone and
above the Linoproductus zone. The
two zones may be very close together
at the Moreno House, but did not actually

58a

59 Float near base of hill east of Moreno hill suggests possibility of fossiliferous occurring below Limpopo.

April 10— Left Authonio in morning and arrived back at Cabrera about noontime, met E. Valencia who asked to take his car, thus ending our trip as far as Cabrera was concerned. Packed and covered the two remaining boxes. We did a little over 600 miles in the Valencia car.

April 11 —
Packed up and moved over to Alton. Left Cabrera about 3 P.M. and arrived about 5:30.

April 12—

1 Pack 7 - pictures 7-12 views of Moreno.

1 Pack 8 - picture 12 — views of Alton from east side looking west to Cerro del Chino, S of Riquitol. Picture 2 was taken from behind up the hill.

Morenia limited at hills east of Alton. These are low and composed of a light gray oolitic with fine-grained limestone through the rocks which originally a very fine-grained argillaceous ooze. The gravel on the hill seems very high in fossils and rocks of quartz occur in highest hill just east of Hill. The oolitic is light gray which fresh, often weathering with a rusty surface.

These low hills are flanked on the east by a higher range, and to the NNW by a high range. To the NW the highest range occurs. To the west is open plain but on the south to the Cerro de Cuevas is a high

range. The schistosity seems to be about 15°.

60

W. G. Reese, Santa Rita Hotel, Tucson Ariz
Map on sale Nogales Creamery, Nogales, Ariz.

Cameo Range
Drove from Travel Trail, mainly SE (120-140)
One afternoon visited Cameo. 1/2-
2/3 up butte west side of the range is
composed of crumbling granite
gneiss, grey and pink. On top
of this I find light grey schist
that breaks into ledge plates. a solid
white band dips 28° to the NE (74°)
the granite & schist have a transition
zone as though alteration took place.
I think the contact is a fossil one.
This butte is only a single foothill but
the schists continue to the top of it.
As I went farther into the hills
the material contains numerous
very sandy beds and varies in color
between light & moderately dark gray
some distinctly sand beds and thicker &
and brownish in color. A thick bed dips
26° to NE (50°)

Followed only dimly leading
to east & N end. Reached main
crest of hills to find other hills
to east. Highest crest at N end
still in schistose but highly
altered rocks. Lots of
limestone on climb up N side
Rock shot full of ~~quartz~~ quartz
veins and joint surfaces covered
with a green mineral, probably
epidote.

61 The strikes of the rocks here are into the hills to the east and of think it safe to say that the whole canon, except for the west granite is composed of these siliceous schists.

ask for additional photographs:

	V	L	R
Flight 24 —	31	13	31
	33	to	33
	35		35
	37	43	37
	39		39
	41		41
			43
			45
			47

	V	L	R
Flight 102	15-37,	15-37	17-35

	V	L	R
Flight 43	93	93	93
	to	to	to
	105	105	105
	9		
	121		
	30		
	124		

V = vertical
L = left, R = right

Fare to Ayer's
Telegram
Breakfast Lunch
0.60
6.00

62 April 13 — Santa Theresa.

Between 4 & 5 miles east of Alt the Altar river valley narrows to a short gorge and here a dam is to be constructed. On river banks on S side lies a thick accumulation of fine alluvial sediments. Up the slope to the south angular boulders are abundant in the float. Under the schist comes a granite gneiss with muscovite. The granite is coarse grained and in places appears like a pegmatite. Between the hills, in the valley and desert floor occurs a red sandstone. The schist here is much more deformed than at Altar. The red ss is best developed east of NE of the dome site. where it seems to dip to the NE. The specular hematite is formed at the contact of the schist & granite and occurs in abundance in an area at the base of Pk 8. but about 0.1 mile south of the river.

Fine red ss in a conglomerate occurs at arroyo de Lozano. Pebbles usually small & rounded but angular but a few large ones 5 - 6". This material has a fairly modern appearance & may be related to the conglomerate of Pitiquito.

Pack 8 — 3, 4. Cathedral at Tubutama

Red ss exposed in Tubutama and along road from Santa Theresa to Tubutama. On W outskirts of Tub. the ss is red but with little congl.

Pack F # 1, 2.
Sheet 1

63 About 1 mile SE of Afl is a hill composed of fine-grained greenish-green rock and on the SE flanks of this hill are sediments. Beginning at the NE, nearest Afl the hill are light grey somewhat blocky finely bedded about 1/2" thick made up of light grey fine-grained material probably volcanic ash. This dips 30° NE (25°). Looked for fossils in it but saw none. Higher the beds become somewhat heavier bedded and are a soft light red ss. interbedded with possible fresh water L.T more ash! This locality is SE of Afl 160°. Here the dips is 50° NE (50°). It thinks these beds probably belong to the red-bed sequence but of Afl but are locally different here.

April 14

64 Beside road to Cerro about 9 miles NW of Actar occur prospect pits for limestone in a red valley shale. about 25' below these lie beds occur numerous fossils. Fine shale so extends on both sides of road for long distances to east & west. This is undoubtedly same sequence as SE of Pitiquito. Here beds strike about 300° & 310°, dip moderate.

Started for N end of Channel but never made it because road failed. Walked to N end Channel about 30 minutes from camp. Started in gray, 55.4 crossed 4 foothills. The first is basalt, The next two red shale & so the third is gray as first, The fourth is red shale & silt. The last lying on the main is separated from the foothills by a valley in soft red & yellow pencil-weathering shale. The pebbles of shale are very small and slender. Up this hill the shale is interbedded with conglomerate. This rock forms the top of the hill.

Up the slope for 175' bedrock is covered by slide of red conglomerate rocks but at 175' comes in. The first conglomerate beds in place which is the red conglomerate occurs in place up to 380'-390'. Here rock in place is a basalt porphyry with small phenocrysts of plagioclase & pyroxene mineral. Has dark brown to black color. On the end of ridge at 400' no bedrock is visible. Must have to be constructed to 400'

the Proveabora in any way. The whole sequence belongs to the conformate series, at least on this end of the strat.

65 — On the W side of the saddle where I crossed is a deep reentrant with an arroyo descending it. The reentrant is occupied by rhyolite but the west side of the canada is a ridge made up of white and gray rhyolite and includes pieces of what seem to be basalt. Also may be brecciated material.

Parks 8 — 5, 6 — NE and Chamote
7 — Camera from hill back of Nile on N edge of altar.

Correction — The real conformate goes up the hill about half-way on the E side to 175' according to my barometer. The material called conglomerate above that is a rhyolite. This is true also of the material in the reentrant called conf. This is a rhyolite, possibly a breccia and not a conglomerate. I went clear over into the adjacent valley for about 1/4 mile but found only the rhyolite, and places this is a mass of clumps, often rounded, with a groundmass of flow breccia.

Probably a flow

April 15—

66 Formby (alberta) 0.50
Lunch 0.50

Dip 47° to NE (20°) about ¼ mi. E of base of Mtn.

3 Section started at contact of cgl. & basalt on side of Mtn.

35° Slope ∠ 9°, Elevation down to base of low foothills 200' = 1266'
Section down to base of foothill consists of coarse greenish & reddish congl., thin yellowish & red shales. Top of sequence at base of right is in grey shale in thick interval in places marked by intrusions

32° 160 paces with last 60 in grey congl. ss.

32° 100 paces — mostly in red & green crumbly shale with some green ss. Last 20 paces in crumbly yellow shale with thin ls ledges at base. Strike 315°, dips to east nearly vertical. (50°-60°)

47° 47° 294 paces in yellow crumbly shale with thin ss & ls ledges & concretions. Probably same shale as at base of Mtn at N end.

47° 100 paces red shale & grey congl ss

47° 320 paces mostly covered but much red shale float

47° 100 paces red shale & grey congl ss

47° 195 paces red shale float

$$
\begin{array}{r}
.158\overline{)200} \\
158 \\
\hline
420 \\
316 \\
\hline
1040 \\
948 \\
\hline
920
\end{array}
\qquad (1266
$$

180
100
294
100
320
100
195
157
170

1616
25
8080
3232
40400

470 157 paces basalt

67

470 170 paces covered to cave where shale & gabbro intrusions are present

4040 feet
+1266'
5306 feet

Pack 8 - pictures 8, 9, 10 — foothills near Sand Canada looking N. 9 + 10 are panoramas.

By a mistake Numbing work was stopped here. So the river is about another mile of sediments. From the road to the river I would guess about a quarter mile at the locality, where the fossils were taken on Apr. 14.

About halfway to 72 pass to equal 10 Mi. Also pass shoulder at 6 Mi.

Schists east of Alton, Dip 14° to SE (175°). Granite to thinly graywacke foliated with bedding and shale strata fairly well coinciding

✓ Page 8 — P. 11 — looking NW toward the Canada showing low relief hills in foreground.

✓ P. 12 — Altar archtwith high peak of Carneo in background.

April 16 - Left Alfan about 9:AM for Santa Ana. East of Alfan Cambro extends for maybe 9 miles east of Alfan. Then comes wide stream of plain. To north of road just East of Alfan is a long long range of variously colored rocks that finally drift away to the north of the road about 45-46 kilos east of Alfan. These rocks are of purple and red sandstones and shales. About 50 kilos. east of Alfan ledges of limestone are conspicuous on the south side of the road. These contain large oysters. These sediments suggest Cretaceous beds on the east flank of Cathedral.
Arrived in Santa Ana about 3 P.M.
Went to hotel for night.

April 17 -
Freighted 806 kilos of fossils to Consul at Nogales.
Took train for Guadalajara at 7:45 in the evening. Train 2 hours late.

April 18-20 -
Lost 12 hours to Guadalajara and were there held for the night train to Mexico City on the 20th.

April 21 -
Arrived in Mexico City 2 hours late.
Took room in 101 London. Called on Foshags in evening. Dined with Ballados.

April 22 -
Pullman office first thing in morning and got reservations for Thurs 6. Went to Institute and called on Contreras.

69

Came to aged letter label for Mr Llewellyn Taeuber's head, loc. 13 c. Send also to reference to Bur Fisheries monograph on Archeozoa. Explain dict technique in a letter to Dr. Contreras.

April 23-
Spent day with Arellanes

April 24-
Sent invertebrates from Paleozoic. Send descriptive papers & material sent to Dr. Griffiths, if possible. Mr Powers & papers on Mexican fossils by Barbeh. See if Contreras belongs to P.S.

April 25- Walked about city.

April 26- Went to Pullman office, wrote letters, read.

April 27-29-
Saw Alberto, visited in city

April 30- Went to Tehuacan with Forbes

May 1— Road to Zapotitlan too bad had to abandon trip. Went on to Orizaba and Fortin in afternoon. Saw salt works & Orizaba quarries at Loycaba.

May 2- Came home through Puebla. Rain each day of trip.

May 3- Made ready to come home.

May 4- Spent most of day with Arellanes.

70

May 5 - Went to divide between Popo' and Ixtaccihuatl at 12,800 feet. Spent an hour or two above timber-line.

May 6 - Nice party before coming home with Arellano, Calvo A and Fosbrey. Left at 9 P.M. for Laredo.

May 7 - Train all day 6 hours late.

May 8 - Arrived Laredo about 7:30 A.M. Through American customs about 9:30. Arrived San Antonio at 3 P.M. Left for St. Louis 7 P.M.

May 9 - Delayed south of Texarkana by an accident. Arrived St. Louis 2 hours late at 1 A.M.
Reopen matter of honorary customs

May 10 - Left St. Louis at 1:10.

May 11 - Arrived Washington 11:20 AM and flew on time.